



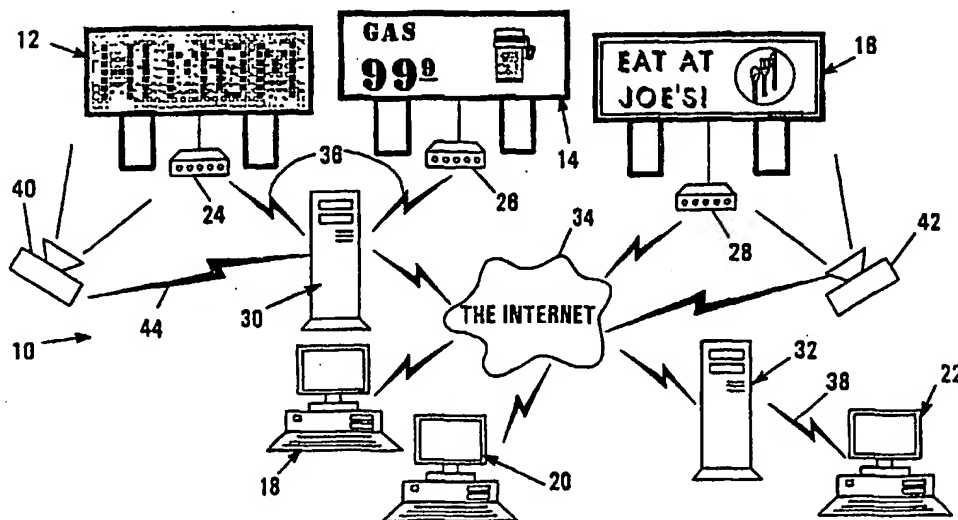
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(54) Title: **MULTI-USER ELECTRONIC SIGN MANAGEMENT SYSTEM**



(57) Abstract

A multi-user electronic sign management system (10) incorporates an electronic communications link (34, 36, 38) to permit the receipt of message requests from a plurality of independent users. The message requests received over the electronic communications link (34, 36, 38), which are associated with selected messages and selected times to display those messages, are processed by the sign management system (10) to generate control signals suitable for controlling the display of such messages on an electronic sign (12, 14, 16) at appropriate times.

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MULTI-USER ELECTRONIC SIGN MANAGEMENT SYSTEM**Field of the Invention**

5 The invention is generally related to electronic signs, and in particular to the generation, scheduling and display of messages on electronic signs.

Background of the Invention

Electronic signs are used in a multitude of applications to display
10 informational and/or entertainment messages such as announcements or advertisements to persons viewing the signs. For example, electronic signs are often used in public facilities such as airports and train stations to display arrival and departure information to travelers, and are used on roads to provide traffic information to drivers. Other concerns such as hotels, malls, retail stores, supermarkets, theaters,
15 convention centers, sports facilities, restaurants, bars, casinos, and the like, may also utilize electronic signs, e.g., to advertise upcoming events or specials, or to provide informational messages to customers and/or potential customers.

Electronic signs are often located either indoors or outdoors, and typically in public places where large numbers of relevant viewers can view the signs. A number
20 of different display technologies have been developed, including incandescent lights, light emitting diodes (LED's), liquid crystal displays (LCD's), cathode ray tubes (CRT's) and plasma displays (among others). Electronic signs can significantly vary in display capability. For example, electronic signs can be as simple as small monochrome 7-segment LED or LCD displays capable of displaying only a few
25 digital characters at a time. Electronic signs can also be as complex as large full-color billboard-type displays capable of displaying animation and full-motion video, such as Sony JumboTron displays found in locations such as stadiums and arenas, as well as in Times Square in New York City.

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An electronic sign is typically controlled by a sign controller implemented as a dedicated electronic controller or a general purpose computer running sign control software, and interfaced with the sign through a wired or wireless interface. Often, an operator is capable of creating/editing messages, schedule messages, and perform
5 maintenance functions for a sign via a sign controller. Furthermore, in some applications, multiple signs may be controlled by a single device such as a server, and connected via a wired or wireless network. The signs may be owned by the same party, or may be owned by different parties and managed by a single entity contracted by the parties to manage their signs.

10 Some electronic signs are used exclusively by their owners to display messages such as announcements and/or advertisements related solely to the owners' interests. Other electronic signs are used exclusively as a source of supplemental revenue to display messages for others for a fee. Still other electronic signs may be used to display both types of messages, enabling the signs' owners (also referred to as
15 "message display service providers") to generate a profit or at least recoup some of the costs of the electronic signs through supplemental advertising revenue.

Generating revenue from electronic signs, however, can be problematic due to the difficulties involved in matching potential advertisers with message display service providers -- often quantified in terms of the "transactional costs" or overhead
20 associated with contracting for the display of an advertisement on a particular electronic sign. For example, a potential advertiser in New York might wish to run an advertisement on an electronic sign in Las Vegas. However, the potential advertiser may not know where the best location to run the advertisement in Las Vegas would be, or if a particular location is identified, who is the owner of a sign at that location.

25 Often, to handle placement of the advertisement, the advertiser would contact an advertising agency in New York, who would then attempt to locate and contact another agency in Las Vegas that works with one or more providers to assist in locating a desirable sign and handling the transaction. The Las Vegas agency, often with assistance from the New York agency, would typically produce the
30 advertisement in the format required for the particular sign, and would handle the contractual, scheduling and monetary issues as required to ensure that the

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advertisement is displayed as agreed and the message display service provider is compensated accordingly.

The amount of interaction between agencies, advertisers, and message display service providers typically magnifies the transactional costs to an advertiser, specifically in terms of monetary expense, delay and overall effort and frustration. As such, in many instances electronic sign advertising may only be economically justified for only relatively large advertisement orders, e.g., to display one or more advertisements on multiple signs and/or multiple times on a given sign over a particular time period, where the percentage attributable to transactional costs is relatively low. For the smaller advertiser that wants to run an advertisement only a few times at a single location, the time and effort is often simply not justified.

In addition, some message display service providers permit individuals to contract to have personal announcements such as birthdays, wedding proposals, anniversaries, and the like to be displayed on their signs. However, as with smaller advertisers, often the transactional costs limit the availability of such services to many individuals.

It is believed that a significant amount of potential advertising revenue is lost due to the excessive transactional costs associated with conventional manners of contracting for the display of advertisements on electronic signs. It is similarly believed that lowering such costs would make electronic sign advertising a viable option for a greater number and variety of potential users, and in turn increase advertising revenues for message display service providers and the like.

Therefore, a significant need exists in the art for a manner of facilitating the interaction between message display service providers and the potential users of such services, in particular for lowering the transactional costs, time and effort associated with securing the display of messages on electronic signs, and otherwise simplifying the procedure for programming electronic signs.

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Summary of the Invention

The invention addresses these and other problems associated with the prior art by providing an apparatus, program product, and method of controlling an electronic sign in which an electronic communications link in a sign management system is used to accept message requests from a plurality of users. The message requests received over the electronic communications link, which are associated with selected messages and selected times to display those messages, may then be processed by the sign management system to generate control signals suitable for controlling the display of such messages at the appropriate times.

By accepting message requests over an electronic communications link, multiple independent users are often able to independently secure the display of desired messages on a given electronic sign with significantly lower transactional costs, as well as with reduced delays and processing times. For example, in one particularly useful application of the invention, a sign management system may be coupled to a public network such as the Internet to permit users that are completely independent of a message display service provider (as well as independent of one another) to request that specific messages be displayed on an electronic sign controlled by that provider.

In addition to providing the ability to receive message requests over an electronic communications link, it may also be desirable to integrate additional features in a sign management system to further simplify the interaction between users and message display service providers. For example, in some applications it may be desirable to incorporate additional user information such as payment information with message requests, so that processing of the message requests can include the automated handling of payments between users and message display service providers.

Moreover, in some applications it may be desirable to permit users to locate specific electronic signs out of a set of available signs that meet location, availability, display capability and/or other criteria suitable for the users' particular needs, and then direct message requests as appropriate to ensure that requested messages are displayed on selected electronic signs.

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In some applications it may also be desirable to provide interactive message generation capabilities that permit users to construct messages that are consistent with the display capabilities of the electronic signs upon which the messages are displayed. To further the ability of a user to construct a message, it may also be desirable to
5 simulate the operation of an electronic sign in displaying that user's message so the user can get a better feel for the ultimate look and feel of the message.

In other applications it may also be desirable to incorporate an image capture device, positioned to view an electronic sign, into a sign management system. Incorporation of an image capture device could permit, for example, a user to view a
10 real-time image of an electronic sign during the process of selecting among multiple available signs. Also, a user could be provided with proof that a message was in fact displayed on an electronic sign by providing a captured image of the electronic sign during display of the message.

These and other advantages and features, which characterize the invention, are
15 set forth in the claims annexed hereto and forming a further part hereof. However, for a better understanding of the invention, and of the advantages and objectives attained through its use, reference should be made to the Drawings, and to the accompanying descriptive matter, in which there is described exemplary embodiments of the invention.

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Brief Description of the Drawings

FIGURE 1 is a block diagram of a sign management system consistent with the invention.

FIGURE 2 is a block diagram of a hardware platform for a server computer
5 from the sign management system of Fig. 1.

FIGURE 3 is a block diagram illustrating the primary software components in a server computer and a user computer in the sign management system of Fig. 1.

FIGURE 4 is a block diagram of a computer display from a user computer in the sign management system of Fig. 1, illustrating the display of a message request
10 home page in a browser window.

FIGURE 5 is a flowchart illustrating the sequence of operations performed in the sign management system of Fig. 1 during selection of a sign.

FIGURE 6 is a block diagram illustrating a HTML document utilized during the sequence of operations of Fig. 5.

FIGURE 7 is a flowchart illustrating the sequence of operations performed in the sign management system of Fig. 1 during creation or editing of a message.
15

FIGURE 8 is a flowchart illustrating the program flow of a message editor application executed by a user computer in the sign management system of Fig. 1.

FIGURE 9 is a block diagram illustrating a message editor window utilized by
20 the message editor application of Fig. 8.

FIGURE 10 is a block diagram of a message record data structure suitable for use in the sign management system of Fig. 1.

FIGURE 11 is a block diagram of a sign record data structure suitable for use in the sign management system of Fig. 1.

FIGURE 12 is a block diagram of an order record data structure suitable for use in the sign management system of Fig. 1.
25

FIGURE 13A is a flowchart illustrating the program flow of the convert message routine referenced in Fig. 8.

FIGURE 13B is a flowchart illustrating the program flow of the create
30 simulation routine referenced in Fig. 8.

FIGURE 14 is a flowchart illustrating the sequence of operations performed in the sign management system of Fig. 1 during scheduling of a message.

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FIGURES 15A and 15B are block diagram illustrating HTML documents utilized during the sequence of operations of Fig. 14.

FIGURE 16 is a flowchart illustrating the sequence of operations performed in the sign management system of Fig. 1 during selection of a proof mode.

5 FIGURE 17 is a block diagram illustrating a HTML document utilized during the sequence of operations of Fig. 16.

FIGURE 18 is a flowchart illustrating the sequence of operations performed in the sign management system of Fig. 1 during selection of payment.

10 FIGURES 19A, 19B and 19C are block diagrams illustrating HTML documents utilized during the sequence of operations of Fig. 18.

FIGURE 20 is a flowchart illustrating the sequence of operations performed in the sign management system of Fig. 1 during handling of a submitted order.

FIGURE 21 is a flowchart illustrating the sequence of operations performed by the order verification module in the sign manager of Fig. 3.

15 FIGURE 22 is a flowchart illustrating the sequence of operations performed by the monitoring & approval module in the sign manager of Fig. 3.

FIGURE 23 is a flowchart illustrating the sequence of operations performed by the scheduler module in the sign manager of Fig. 3.

20 FIGURE 24 is a flowchart illustrating the sequence of operations performed by the proof of display module in the sign manager of Fig. 3.

FIGURE 25 is a block diagram of an alternate, distributed sign management system consistent with the invention.

FIGURE 26 is a flowchart illustrating the sequence of operations performed to handle a message request in the sign management system of Fig. 25.

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Detailed Description

Turning to the Drawings, wherein like numbers denote like parts throughout the several views, Fig. 1 illustrates a sign management system 10 consistent with the invention. Sign management system 10 is principally used to electronically interface one or more electronic signs (e.g., electronic signs 12, 14 and 16, owned and/or operated by one or more message display service providers) with a plurality of users, e.g., coupled to sign management system 10 through one or more user computers 18, 20, 22.

Each electronic sign 12, 14, 16 typically includes a dedicated sign controller 24, 26, 28 that is configured to operate the electronic sign in any of several manners known in the art. Each controller 24-28 may be, for example, an embedded controller designed specifically for its associated electronic sign, or a general purpose computer executing software that is specifically tailored for the associated electronic sign. Various electronic communications links may be used to interface an electronic sign to its dedicated controller, including wired or wireless links, dial-up links, network links, etc.

In general, each electronic sign may be considered to include practically any information display device, other than a requesting user's computer, that is capable of being viewed by the intended audience of a particular message. Each electronic sign may be implemented using any number of known display technologies, including LED's, LCD's, plasma displays, CRT's, banks or arrays of CRT's, bulb displays, flip dot displays, electro-mechanical displays, etc. Further, each electronic sign may be located outdoors or indoors -- typically at any location well suited for viewing by the intended audience of the sign, e.g., in a public place.

In the embodiment described hereinafter, sign management system 10 is principally implemented using one or more server computers (e.g., server computers 30, 32) interfaced via electronic communications links between user computers 18-22 and electronic signs 12-16. In other embodiments, however, other types of computers (e.g., personal computers, workstations, portable computers, minicomputers, midrange computers, mainframe computers, etc.), electronic devices (e.g., dedicated and/or embedded controllers), or combinations thereof may be used in the alternative to implement the sign management functions described herein.

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The electronic communications link between each server computer and each user computer can be a public link, e.g., over a public communications network such as the Internet 34 (as with user computers 18 and 20), or over a private or proprietary link, e.g., direct or dial-up link 38 between server computer 32 and user computer 22.

5 Similarly, the electronic communications link between each server computer and each electronic sign can be a public link (as illustrated by sign controller 28), or a private or proprietary link, e.g., links 36 between server computer 30 and sign controllers 24 and 26. Furthermore, the electronic communications links between server computers in distributed applications where more than one server computer is utilized may also be

10 public (as with server computers 30, 32) or private (not shown in Fig. 1). In addition, each electronic communications link between server computers 30, 32 sign controllers 24-28 and user computers 18-22 may be physically implemented using any known wired or wireless communications mediums, including but not limited to direct cables, radio frequency (RF) transmissions, analog or digital dial-up lines (e.g.,

15 POTS, ISDN, xDSL, or broadband cable), infrared (IR) transmissions, satellite transmissions, computer network cables, etc., and combinations thereof.

As is also shown in Fig. 1, one or more image capture devices 40, 42 may also optionally be interfaced with sign management system 10, with each coupled to a server computer through either a private link (e.g., via direct cable 44 for image

20 capture device 40) or a public link (e.g., as with image capture device 42). Each image capture device, which may be implemented, for example, using any commercially-available digital or analog still or video camera, is typically positioned relative to an associated electronic sign such that the display of messages on the electronic sign can be viewed through the image capture device. An image capture

25 device may be located at a fixed location, with a fixed focus and field of display, or can have a varying field of display controllable by the server computer. Moreover, an image capture device may be integrated with additional communication electronics, e.g., to provide the electronic interface with a server computer, to compress captured images prior to transmission to a server computer, to handle commands from the

30 server computer, etc. Moreover, one or more of such functions could be integrated into a server computer or a sign controller, among other variations. The use and operation of the image capture devices will be discussed in greater detail below.

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From a business perspective, the various components in a sign management system 10, as well as electronic signs 12-16, user computers 18-20, and the electronic communications links therebetween, may be owned and/or operated by the same or different entities. For example, an owner of one or more electronic signs may utilize a sign management system to rent advertising space on the signs from users having access to the system over the Internet or another public manner of access. Also, a sign management system could be owned and operated by an intermediary party that contracts with one or more owners of electronic signs to rent advertising space on those signs to independent users. The owner of a sign management system could also incorporate kiosks placed in public places such as retail malls and stores as user computers to permit users that would not otherwise have computer access to the sign management system to rent advertising space on an electronic sign. It will be appreciated that a wide variety of alternate business models are also possible consistent with the invention.

As will become more apparent below, a principal advantage of the sign management system implementations disclosed herein is that the processes of creating, editing and/or retrieving message requests from users; processing those message requests to verify compatibility with sign capabilities; securing payment from users; monitoring message requests for appropriate content; scheduling message requests; controlling electronic signs to display those message requests; and providing feedback to users to confirm display of messages, may all or in part be implemented in a highly automated manner, requiring little if any human interaction beyond that of the users generating the message requests. As a consequence, the transactional costs typically associated with contracting for the display of messages on electronic signs are typically reduced, resulting in less effort, expense and frustration than conventional systems. Moreover, with reduced transactional costs, often individual users or small advertisers, who would not otherwise be willing to expend the time, effort and expense necessary to get a message displayed on an electronic sign, are more likely to rent advertising space, presenting additional advertising revenue opportunities for message display service providers.

Fig. 2 illustrates an exemplary hardware and software environment for server computer 30. Computer 30 typically includes at least one processor 32 coupled to a

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memory 34. Processor 32 may represent only one or multiple processors (e.g., microprocessors), and memory 34 may be implemented using any of a number of known memory architectures, including one or more levels of volatile memory such as dynamic random access memory (DRAM) and/or one or more levels of cache
5 memory (whether integrated into or external to a processor), as well as various non-volatile or backup memories (e.g., programmable or flash memories), read-only memories, etc. In addition, memory 34 may be considered to include memory storage physically located elsewhere in or accessible by server computer 30, e.g., as stored in a mass storage device 38 or on another computer coupled to server computer 30
10 through network interface 40.

Server computer 30 also typically receives a number of inputs and outputs for communicating information externally. For interface with a user or operator, server computer 30 typically includes a terminal interface 36. Also, as discussed above, additional storage may be provided through the use of one or more mass storage
15 devices 38, e.g., a floppy or other removable disk drive, a hard disk drive, a direct access storage device (DASD), an optical drive (e.g., a CD drive, a DVD drive, etc.), and/or a tape drive, among others. Furthermore, server computer 30 may include an one or more network interfaces 40 to interface the computer with one or more networked devices, e.g., other server computers, user computers, sign controllers, and
20 the like, using any of the aforementioned communications links. It should be appreciated that server computer 30 typically includes suitable analog and/or digital interfaces between processor 32 and each of components 34, 36, 38 and 40 as is well known in the art.

Each user computer likewise includes any of a number of conventional
25 hardware environments, typically including one or more processors, a memory architecture, and various input/output devices as is well known in the art. A user computer can include any electronic device suitable for receiving user input and interacting with a user, as well as communicating with the sign management system. Exemplary devices can include, desktop or portable computers, hand-held computers,
30 and kiosk terminals, among others.

Server computer 30 operates under the control of an operating system 42, and executes or otherwise relies upon various computer software applications,

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components, programs, objects, modules, data structures, etc. to implement the sign management functions described herein (e.g., sign manager 44 and user interface 46, among others). Moreover, various applications, components, programs, objects, modules, etc. may also execute on one or more processors in another computer
5 coupled to computer 30 via a network, e.g., in a distributed or client-server computing environment, whereby the processing required to implement the functions of a computer program may be allocated to multiple computers over a network.

In general, the routines executed to implement the embodiments of the invention, whether implemented as part of an operating system or a specific
10 application, component, program, object, module or sequence of instructions will be referred to herein as "computer programs", or simply "programs". The computer programs typically comprise one or more instructions that are resident at various times in various memory and storage devices in a computer, and that, when read and executed by one or more processors in a computer, cause that computer to perform the
15 steps necessary to execute steps or elements embodying the various aspects of the invention. Moreover, while the invention has and hereinafter will be described in the context of fully functioning computers and computer systems, those skilled in the art will appreciate that the various embodiments of the invention are capable of being distributed as a program product in a variety of forms, and that the invention applies
20 equally regardless of the particular type of signal bearing media used to actually carry out the distribution. Examples of signal bearing media include but are not limited to recordable type media such as volatile and non-volatile memory devices, floppy and other removable disks, hard disk drives, optical disks (e.g., CD-ROM's, DVD's, etc.), among others, and transmission type media such as digital and analog communication
25 links.

In addition, various programs described hereinafter may be identified based upon the application for which they are implemented in a specific embodiment of the invention. However, it should be appreciated that any particular program nomenclature that follows is used merely for convenience, and thus the invention
30 should not be limited to use solely in any specific application identified and/or implied by such nomenclature.

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Those skilled in the art will recognize that the exemplary environments illustrated in Figs. 1 and 2 are not intended to limit the present invention. Indeed, those skilled in the art will recognize that other alternative hardware and/or software environments may be used without departing from the scope of the invention.

5 Figure 3 illustrates the primary software components in a representative server computer 30 and user computer 18 in performing the various sign management functions described herein. The interaction between a user and the sign management system is principally implemented at the server end in user interface module 46, which in this implementation utilizes a transmission control protocol (TCP) server 50
10 and a common gateway interface-binaries (CGI-BIN) gateway application 52. TCP server and gateway 52 may be implemented, for example, in any commercially-available Internet or "web" server application, as is well known in the art. From the user's perspective, the user interface functions are handled by a JAVA or Active X client application 54 and a web browser 56, each resident in the memory of user
15 computer 18.

CGI-BIN gateway 52 typically interacts with web browser 56 to provide a series of platform-independent forms, e.g., in the format of hypertext markup language (HTML) documents, for viewing on web browser 56. For user interface operations that cannot be handled using an HTML-based interface, however, a
20 locally-resident client sign editor application 54 is typically utilized to supplement the user interface operations of the sign management system.

In the illustrated implementation, for example, CGI-BIN gateway 52 and web browser 56 are utilized to handle sign management functions such as selecting electronic signs and selecting time slots for display of messages, as well as additional
25 functions such as handling payment and other transactional issues, and providing an on-line tutorial for the user. Further functions, such as the display of disclaimers, retrieving images as proof of display or as a mementos, user authentication, confirmation of orders, and other features described below are generally allocated to the HTML-based components of the user interface.

30 The client application 54 that executes locally on a user's computer interfaces with TCP server 50 to handle additional user interface operations that are not well suited for an HTML-based interface. Predominant among these operations is the

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creation and editing of messages, as well as the simulation of those messages for display on a user's computer. As will be discussed in greater detail below, the client application may either be platform-independent, as with a JAVA applet, or may be a platform-dependent application, such as one or more Active X controls that are specific to the Microsoft Windows environment. Moreover, multiple client application formats may be supported to permit users having different platform capabilities and configurations to interface with the sign management system. Often, information about a particular user's capabilities and/or platform configuration (e.g., the user's operating system and platform) can be readily obtained (e.g., through the use of simple JavaScript functions and the like), so that automated determination of an optimal application format may be made. In the alternative, a user may be required to manually specify which of multiple application formats is optimal for the user.

Further in the illustrated implementation, it is desirable to have TCP server 50 download client application 54 to the user's computer during the initial interaction between the user and the sign management system. This eliminates the need for the user to specifically obtain and install the client application prior to interacting with the sign management system.

It should be appreciated that a wide variety of alternate user interface applications may be utilized consistent with the invention, e.g., alternate interface protocols, including active server pages (ASP), scripting languages, and other platform-independent or specific applications that are either fully resident on the user computer or are downloaded on an as-needed basis from the server computer to the user computer. Moreover, in some implementations, much of the functionality can be allocated to the server computer, with the user computer acting more as a terminal that displays the results of the operations performed by the server computer. It should also be appreciated that the functionality of client application 54 and web browser 56 may be combined into a dedicated application, or that a web-type interface can be replaced with a proprietary interface, if desired. Furthermore, it may be desirable to support multiple platforms and configurations, or in the alternative, to require users to access the system through a single uniform interface.

While a wide variety of other modifications may be made to the illustrated user interface, it should be appreciated that the implementation described herein relies

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principally on the well-known and widely-available set of interface tools that are conventionally supported by a vast majority of the computers having access to the Internet and other public networks. As a result, a new user wishing to interact with a sign management system will typically have little difficulty in (1) directing
5 commands and receiving instructions from the sign management system and (2) learning and understanding the interface provided by that system. As a result, the learning curve associated with interacting with the sign management system can be considerably reduced.

Sign manager 44 principally implements the handling and processing of
10 message requests generated via user interface 46. Sign manager 44 is under the principal control of a main control module 48, which is coupled to both TCP server 50 and gateway 52, as well as to a database 58, an order verification module 60, a monitoring and approval module 62, a scheduler module 64 and a proof of display module 68. The primary functions performed by main control module 48 include
15 receiving user requests from the user interface, retrieving information from database 58, and calling and passing information between the various additional modules 60, 62, 64 and 68 as necessary.

Database 58 principally stores electronic records of the various message requests generated by users. Additional information may also be stored in database
20 58, e.g., the display capabilities and other operating parameters of the various electronic signs controlled by the computer, user profile information, pre-existing message content and gallery information, and other required data. Order verification module 60 is principally responsible for verifying the eligibility of a user message request in terms of user profile, user payment and the overall compatibility of the
25 request with various order parameters. Monitoring and approval module 62 is principally responsible for verifying that the message content is acceptable, e.g., not including any dirty words or other content unsuitable for a particular sign purpose. As will be discussed in greater detail below, monitoring and approval module 62 may include a content filter that is purely automated, and/or may include an additional
30 manual component that requires human approval of the message request prior to display of that request on an electronic sign.

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Scheduler module 64 is principally responsible for allocating time slots for message requests and transmitting control signals to the signs for display of the messages at the proper time. This module is also responsible for responding to requests from other components in the sign management system, e.g., so that a user
5 can reserve a time slot and/or find out at what times a particular sign is available. As will also become more apparent below, scheduler module 64 may handle the actual scheduling of messages, or in the alternative, may transmit those messages prior to display to appropriate sign controllers having their own scheduling capabilities embedded therein.

10 Scheduler module 64 is specifically interfaced with various sign controllers via sign control drivers 66. As with any other peripheral component in a computer system, each sign control driver 66 is configured to interact with scheduler module 64 via a generic protocol, and to likewise interact with a particular sign controller based upon whatever specific requirements exist for that controller. As such, the scheduler
15 module can be constructed to work with any type of sign, with only the program code in a particular sign controller driver specifically coded to conform to the particular requirements of the sign controller.

Proof of display module 68 is principally responsible for interfacing the sign manager with any image capture devices controlled by the server computer. The
20 proof of display module 68 may also include compression capabilities as well as synchronization capabilities to permit an image capture device to capture an image at a specific instant in time while a particular portion of a message is being display on its associated sign. Additional networking capabilities may be incorporated into server computer 30 to provide the electrical interface with the image capture devices as well
25 as the various sign controllers to which the server computer is coupled.

It should be appreciated that the various functions allocated to each of the modules in the sign management system can vary in different applications. Therefore, the invention should not be limited to the particular allocation of functions between the modules as shown in Fig. 3.

30 Figs. 4-24 next describe the operation of the illustrated sign management system in generally the same order in which a user would interact with the system to generate and schedule a message request to be displayed on an electronic sign. These

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different steps along the process are illustrated as being performed using any number of user interface mechanisms, including HTML pages, CGI scripts, and the operation of program code executing on either of the server or user computers. The implementation of these operations to effect the herein described user interface is well within the abilities of one of ordinary skill in the art having the benefit of the instant disclosure. Moreover, it will be appreciated that the different functional operations performed during the operation of the sign management system may be allocated to different components, handled by alternate user interface protocols, and handled in other manners consistent with the invention.

Figure 4 illustrates, for example, a computer display 80 upon which is displayed a window 82 for a browser resident on a user's computer. Shown displayed within the browser window is a message request home page 84 that represents the initial user interface mechanism through which a user might generate a message request for sign management system 10. It is anticipated that a user could navigate directly to home page 84, or in the alternative, could be required to login, or authenticate, from a sign management home page prior to being granted access to the message request home page. User authentication typically requires that a user provide a user name and password to permit profile information about the user to be retrieved and utilized during the generation of the user request. As such, an additional service provided by the sign management system, but which is not shown separately herein, is that of authenticating new users. Such an operation would likely also entail the input of profile information about the user, such as name and address, e-mail address, credit card number, etc.

Message request home page 84 includes a plurality of user interface controls 86-99 through which a user can interactively construct a message request (also referred to herein as a "electronic order"). Each user interface control 86-99 is shown as a button control through which a user can select the control to navigate to another HTML document to operate on a specific portion of a message request. User interface control 86 is used to access a sign selection interface through which a user selects one or more of a plurality of available electronic signs to which a message request should be directed. User interface control 88 permits a user to interactively create and edit a

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message to display on a selected electronic sign. User interface control 90 enables a user to schedule display of the selected message on the selected sign.

User interface control 92 permits a user to select the mode in which the user will receive confirmation or proof of display of the selected message on the electronic sign. User interface control 94 permits a user to select a method of payment for the message request, and user interface control 96 initiates processing of the message request or order once all of the necessary information has been entered by the user.

Additional controls may also be provided on home page 84. For example, it may be desirable to permit a user to access a disclaimer through user interface control 98. The disclaimer may include, for example, information warning the user that the message display service provider is not liable for the content of any messages, and that liability rests solely on the user, similar to a newspaper advertising disclaimer. The disclaimer may also include warnings such as notifying the user of the inherent risks associated with electronic commerce.

The user may also be able to access an on-line help tutorial through user interface control 99. The use of supplemental help systems to provide interactive assistance to a user is well known in the art, and thus will not be described in further detail herein.

It should be appreciated that other mechanisms for accessing and constructing a message request may be used in the alternative. Therefore, the particular HTML-based mechanism described herein is merely exemplary, and should not be used to limit the invention.

Figure 5 illustrates a flow chart 100 of the operations performed when selecting a sign upon selection of user interface control 86 of Fig. 4. First, in block 102, sign parameters representing a search criteria are retrieved from a user. Next, in block 104, a list of signs matching the sign parameters input by the user are retrieved and displayed to the user. Next, in block 106, the sign management system waits for user input, and the sequence of blocks 108-114 detect and handle various types of user input received from a user. Block 108, for example, determines whether the user has requested a preview of a selected sign. If so, a digital image of the sign is retrieved in block 114. As shown in Fig. 5, the digital image may be a real-time image captured using an image capture device associated with that sign, the process of which is

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described in greater detail below. In the alternative, a snapshot of an electronic sign, stored persistently in the sign management system, may be displayed in the alternative.

Returning to block 108, if the received user input is not to preview a sign, block 110 next determines whether the user input is to select a sign for display of a desired message. If so, the sequence of operations is complete, typically resulting in the user being returned to message request home page 84 of Fig. 4. Block 112 represents other user input that may be received from a user, but which is not relevant to the selection of a sign as described herein.

Figure 6 illustrates, for example, one suitable HTML document 116 to be used during the sign selection process in connection with Fig. 5. Document 116 is implemented as a framed document, including a search frame 118 and a results frame 120.

Search frame 118 includes a plurality of user interface controls 122-130 through which various sign parameters can be input by a user. Once the desired parameters are set, a button user interface control 132 may be selected by a user to initiate a search to retrieve and display a list of signs 134 in results frame 120. A selected sign is illustrated at 136, and a plurality of button controls 138-142 are shown for providing user input to the browser with respect to the currently selected sign. Specifically, button control 138 enables a user to accept the currently selected sign and return to the message request home page. Button control 140 performs a CANCEL operation, returning to the message request home page without selecting (or modifying a past selection) of a sign. Button control 142 accesses the preview function discussed above by opening an additional window 144 within which is displayed an image 146 of the selected electronic sign.

A number of sign parameters may be input by a user to search and locate desirable electronic signs among those available through the sign management system. For example, controls 122 and 124 respectively permit a user to input width and height limitations on a sign so that only signs meeting a desired set of dimensions are retrieved. Controls 126, 128 and 130 respectively permit a user to input state, city and street location to locate a sign in a predetermined geographical location. Other sign parameters may also be utilized to restrict a search. For example, the scheduler

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could be accessed to only return signs that are available for a desired time slot. Additional sign parameters may specify certain display capabilities of a sign, e.g., whether a sign is capable of displaying video, whether the sign is capable of colors, the display resolution or color depth of the sign, etc. It should also be appreciated that not all available sign parameters need be specified to limit the search results, and further, that other search criteria may be utilized to retrieve a subset of available electronic signs.

Figure 7 next illustrates a flow chart 150 showing the sequence of operations performed during creation or editing of a message in response to selection of user interface control 88 of Fig. 4. Specifically, in response to a user request to create or edit a message through the HTML message request home page, a message editor client application is executed locally on a user's computer to handle the interactive editing function in creating a message.

In the illustrated implementation, both JAVA and Active X versions of a message editor are supported such that, for Microsoft Windows-compatible user computers, Active X controls are utilized, while for other computing platforms where Active X controls are not supported, a platform-independent JAVA applet is downloaded to the user computer to perform similar functions. As a result, the first step in executing the message editor application is to determine in block 152 whether Active X is supported by the user's computer. This can be performed through requesting input from the user, or in the alternative, through the use of known JavaScript function calls.

If Active X is not supported, a JAVA applet version of the message editor application is downloaded to the user computer in block 154. Next, in block 156, the JAVA applet is started on the user's computer, whereby the initialization of the sign editing process is commenced.

Returning to block 152, if Active X is supported, it is next determined in block 158 whether Active X controls are already resident in the user's computer — that is, if the Active X controls have already been downloaded to the user's computer in the past. If not, the Active X control version of the message editor is downloaded to the user computer in block 160. Next, the Active X controls are started on the user computer in block 162 to initiate the sign editing function. Returning to block 158, if

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the Active X controls are already resident in the user computer, a download of the controls is not necessary, so the already-resident Active X controls can simply be started to initiate the sign editing process.

Figure 8 illustrates the program flow of a message editor application 170
5 consistent with the invention. Message editor application 170 generally operates using an event-driven programming model, whereby, after initializing the editing window in block 172, events are waited upon at block 174 and handled via one of blocks 176-196 as they are received.

The initialization step performed in block 172 may also include retrieval of a
10 message record if such a record already exists for the pending message request being constructed by a user. If, however, no message record has been constructed, the initialization step may also include initialization of a new message record in certain instances.

One event that can be handled by message editor application 170 is that of
15 creating a new page or message record, which is detected at block 176 and handled in block 198 by adding a new message record and initializing the editing window to display a fresh, unedited window. Addition of a message record may also include the association of the new message record with the old message record, e.g., by incorporating a pointer to the new message record in the old record. Once a new
20 message has been added, control returns to block 174 to process additional events.

Another event capable of being detected by message editor application 170 is an event to input text into the message, which is detected in block 178 and handled in block 200 by adding the input text to the message record. Control then passes to block 202 to update the message record to reflect the additional text. Moreover, block
25 202 may also update the editing window to provide a what-you-see-is-what-you-get (WYSIWYG) or interactive editing operation. Control then returns to block 174 to process additional events.

It may also be desirable to be able to import graphics and/or animation into a message, e.g., as stored locally on the user computer, or in the alternative, stored on a
30 server computer or on another computer coupled to the user's computer (e.g., over the Internet). A request to import graphics is detected in block 180 and handled in block 204 by retrieving a graphics file from the user. Control then returns to block 202 to

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update the message record. A similar event for importing animation is detected in block 182 and handled in block 206 by retrieving an animation file from the user and updating the message record in block 202. Retrieval of a graphics or animation file is typically performed in an interactive manner, whereby a user is permitted to browse through a directory structure including appropriate graphics and animation files. A preview function may also be provided in a manner known in the art.

Additional editing functions may be supported. For example, it may be desirable to modify the font and/or colors of textual information. Such a class of events may be detected in block 184 and handled in block 208 by retrieving new font and/or color selections from a user, and then updating the message record in block 202. Moreover, it may be desirable to provide the ability to incorporate special effects into a message. Selection of such effects is detected in block 186 and handled in block 210 by presenting the user with a list of special effects. In addition, it may be desirable to provide the user with a preview of a selected effect. Within such a structure, a user selects an effect, which is detected in block 212, and control passes to block 202 to update the message record to reflect the new effect.

Any number of known special effects may be incorporated into a message consistent with the invention, e.g., scroll effects, wipe effects, swipe effects, reveal effects, blink effects, inversion or flash effects, dissolve effects, rainbow effects, and others.

Another event that may be handled by message editor 170 is a request to select another sign type. Such an event is detected in block 188 and handled in block 214 by getting new sign parameters from the user, e.g., in the same manner as described above with regard to searching for a desired sign. When new sign parameters are obtained, a convert message routine 216 is executed to modify the message as necessary to be compatible with the new sign parameters associated with the newly-selected sign type. Control then returns to block 202 to update the message record and wait for new events.

It may also be desirable to support pre-existing message content via a message gallery stored on the server computer. A request to view such a message gallery is detected in block 190 and handled in block 218 by retrieving a message from the gallery in response to user input. Pre-existing messages may be stored, for example,

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in a content portion of database 58, and may include text information, as well as video, animation, graphics, or other predefined messages that a user is able to use as is or to modify to generate a custom message therefrom.

Yet another editing function supported by message editor 170 is a simulate
5 function, which is detected in block 192 and handled in block 220 by creating a computer simulation of how a message defined by the current message record information would appear on the selected electronic sign. Creation of the simulation incorporates not only the contents of the message record, but also the display capabilities of the sign. Through the feedback provided by a simulation, a user is
10 better able to anticipate how a message being edited will ultimately appear on the electronic sign when displayed. The modeling of a physical electronic sign based upon sign parameters such as display resolution, color depth, and other display capabilities would be well within the abilities of one of ordinary skill in the art having the benefit of the instant disclosure. The simulation modeling is an approximation of
15 the physical sign display and it shows the message text and graphics, with limitations due to the capabilities of a standard computer display.

Upon completion of the simulation, control returns to block 202, whereby the message record is updated if necessary, and the message editor waits for additional events.

20 An additional event detected by message editor 170 is a DONE event, which is detected in block 194 and is used to signify the termination of the message editing process. As shown in block 196, additional edit events may also be supported by the message editor. These events, which are not relevant to the instant disclosure, would be apparent to one of ordinary skill in the art, and thus are not discussed in greater
25 detail herein.

Figure 9 illustrates, for example, an exemplary window 230 through which user interaction with message editor 170 may be handled. As shown in this figure, an editing region 232 is provided that simulates the look and feel of a particular sign (with, for example, the individual LED or LCD pixel locations delimited at 234 for
30 the benefit of the user). An editing cursor 236 is also illustrated in the editing region. Furthermore, a menu bar 238 is shown providing access to advanced functions in the editor. Frequently used functions, such as the aforementioned new page, graphics and

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animation import, font/color selection, effects selection, sign-type selection, gallery viewing and simulation functions, may be accessed through a series of toolbar button user interface controls 240.

In general, a wide range of known editing and effect functions may be utilized
5 to generate a message consistent with the invention. Specifically, it is anticipated that any of the known functionality incorporated into commercially-available word processors, desktop publishing applications, web publishing applications, presentation applications and the like may be utilized to construct a message consistent with the invention. As the functionality of these commercially-available applications is well
10 understood by those of skill in the art, a further discussion of these specific features herein is not necessary for a full understanding of the invention.

One suitable data structure for a message record is illustrated at 250 in Fig. 10. A message record may include, for example, a sequence of fields 252-264 providing various information about a message. Field 252 provides a record of the text to be
15 displayed in the message. Field 254 identifies one or more graphic, video and/or animation files to be displayed in the message. Field 254 may also be used to provide a background for a text message, and multiple graphics images may be utilized and stored in this field to create animation.

Field 256 provides sizing information representing the overall size of the
20 message. Field 258 identifies the sign type for which the message is designed. Field 260 identifies one or more special effects to be utilized in the message, and fields 262 and 264 respectively provide speed indicators to indicate the speed at which an effect or an animation should be displayed (e.g., in frames per second).

The text in a particular message record is represented by a list of line records
25 266 pointed to by field 252. Each line record includes a string field 268 identifying a list of characters. A justification field 270 indicates whether left, center, right or full justification should be used for the list of characters. Fields 272 and 274 identify the length of the string and the coordinate of the line's left upper corner in the message. Field 276 includes a pointer to next line record 266 in the list of lines for the text
30 message.

Each line record identifies a linked list of character records 278 pointed to by string field 268. Each character record in turn includes a character code field 280

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storing an ASCII code or special character to display. Fields 282, 284 and 286 respectively identify a color, font size and font set for the character identified in field 280. Field 288 provides a pointer to the next character record 278 in the list of characters for the line.

5 It should be appreciated that additional and/or alternate information may be provided in each message record consistent with the invention. Moreover, alternate data structures may be utilized to represent the same information as provided in message record 250.

10 Figure 11 illustrates a representative data structure for a sign record 288 that identifies various display capabilities and other sign parameters for a given sign. Field 290 provides a name or other identifier that uniquely identifies a given sign. Field 292 provides location information for the sign, including various geographical information such as state, city, street, country, or address, among others. Field 294 indicates the size or resolution of the sign, and field 296 provides a list of fonts
15 supported by the sign. Field 298 includes the network address of the sign through which the sign controller therefor can be accessed by the sign management system. Moreover, field 299 provides an identification of the color capabilities of the sign, e.g., the color depth or range of color supported by the sign. Additional information, e.g., whether the sign is capable of supporting video or animation, among other
20 display capabilities may also be stored in sign record 288 consistent with the invention.

 Figure 12 illustrates a representative electronic order, or message request, record 300 consistent with the invention. Record 300 includes a user ID field 302 that identifies the user with which the record is associated. Field 304 provides a linked list
25 of message records 250' that are configured in a similar manner to message record 250 of Fig. 10, with the addition of a next record field in each message record 250' that points to the next record in the linked list. As shown in Fig. 12, multiple message records may be associated with a given message request, corresponding to the addition of a new page as described above in connection with message editor 170.
30 With this configuration, multiple messages may be displayed in sequence to constitute a single message for the purposes of the message request.

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Field 306 provides a sign name identifying the selected sign associated with the message request. Similarly, field 308 identifies a time slot, or selected time, at which to display the selected message on the selected sign. Starting, ending, and/or duration information may be used to define a time slot, and multiple time slots (even a
5 definition of a repeating time slot) may be stored in field 308.

Field 310 provides method of payment information through which a user may be billed and a monetary amount can be collected from the user. Field 312 indicates the type of proof that the user has requested in connection with the message request. Furthermore, field 314 provides a proof frame indicator that indicates which frame of
10 a multi-frame message should be captured by an image capture device to confirm display of a particular message on an electronic sign.

Figure 13A next illustrates convert message routine 216 described above in connection with Fig. 8. In particular, as discussed above, if a user modifies the sign type with which a particular message is associated, it may be necessary to modify the
15 message to conform to the display capabilities of the new sign type. The message conversion process begins in block 320 by retrieving the new sign parameters, e.g., by accessing the database 58 for the sign parameters for the currently-selected sign type. Next, in block 322, the resolution is converted, including scaling as necessary the size of the message component and/or requesting the user to select a sub-region of the
20 existing message (if going to a lower resolution) or where to locate a previous message (if going from a lower to a higher resolution).

Next, in block 324, the color space of the message is converted, and in block 326 the frame rate of any animation or video is converted. Next, in block 328 any non-supported effects are converted to other effects mapped to those non-existent
25 effects. If desirable, a user may also be queried to select alternate effects if a particular effect is not supported by a new sign type. It should be appreciated that the conversion of resolution, color space, frame rate and effects are all well known image processing techniques. As such, a further discussion of such operations is not necessary for a full understanding of the invention.

30 Once the display capabilities of the sign have been used to convert the message, the message record is updated in block 330 and the editor window is refreshed, if necessary, in block 332. Conversion of the message is then complete.

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Fig. 13B illustrates create simulation routine 220 in greater detail. First, in block 732, the capabilities of the selected electronic sign are retrieved from the server computer. Next, in block 734, a simulated sign background image is created, based upon the sign capabilities of the selected sign. Typically, the simulated background
5 includes the relative horizontal and vertical dimensions of the sign. In addition, for some signs, it may be desirable to incorporate simulated representations of the individual display elements (e.g., LED's or LCD's) of the physical sign.

Next, in block 736, the first frame of the message is generated using the information in the message record. Next, in block 738, a window is opened on the
10 user's computer display displaying the first frame superimposed over the background image of the selected sign. Next, in block 740, it is determined whether the message includes animations/videos or effects, any of which necessitate the generation of multiple frames for the simulated message. If not, routine 220 is complete.

If, however, a message requires multiple frames, control passes to block 742 to
15 insert a delay based upon the animation speed or effect speed specified in the message record. Next, block 744 generates the next frame for the message, or if the last frame was displayed, regenerates the first message frame. Next, block 746 updates the window to display the next frame. Control then returns to block 742 to continue animating the message. Display of the message occurs repeatedly until the window is
20 closed by the user. In the alternative, the message may be displayed only once. Also, a user may be provided with a control to permit the message to be redisplayed as desired. Other alternatives will become apparent to one of ordinary skill in the art having benefit of the instant disclosure.

Figure 14 illustrates at 340 the sequence of operations performed in
25 scheduling a message in response to user selection of user interface control 90 of Fig. 4. First, in block 342, the desired date and time interval during which to display a message is input by the user. Other or additional chronological information may also be input, e.g., the availability of a repeating time interval, a duration of a time interval, etc. Next, in block 344, the scheduler module is accessed to determine if the
30 requested time interval is available for the selected sign. It should also be appreciated that if no sign is currently selected, the user may be queried to select a sign prior to proceeding to block 344. Next, in block 346, the scheduler returns the result of the

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query, and it is determined whether the requested time interval is available. If not, control passes to block 347 to indicate that the time interval is unavailable, and control returns to block 342 to have the user input alternate information.

5 If the time interval is available, however, control passes to block 348 to indicate such to the user and display a list of the available time slots that match the time interval requested by the user. Next, in block 349, the desired date and time corresponding to at least one of the available time slots is obtained from the user. Next, in block 350, the cost (if any) of the message is displayed to the user. In particular, different signs may have different cost structures, which may also vary
10 depending upon date, time, or other chronological information. For example, displaying an advertisement outside of a stadium just prior to a football game would demand a higher price than displaying the same message on the same sign at 4:00 AM. Any number of pricing structures may be supported, as would be well known to those in the advertising art.

15 Next, block 352 waits for confirmation from the user. Based upon the confirmation, it is determined whether the user wishes to proceed in block 354. If the user does not wish to proceed based upon the cost and/or availability, control passes to block 356 to query the user as to whether the user wishes to select another time slot. If so, control returns to block 342. If not, however, the message scheduling
20 operation is completed without a time slot selected for the message.

 Returning to block 354, if the user responds with positive confirmation, control passes to block 358 to update the message record with the selected time slot. Next, in block 360, the scheduler is notified to reserve the requested time slot for a short period of time (e.g., one hour). This limited-duration reservation of a time slot
25 in essence permits a user to lock-out other users from a particular time slot while that user completes the message request. Otherwise, a user might select a time slot, then proceed with creating a message and submitting an order, only to find that another user has since purchased that time slot in the interim. Of course, if the user with which a reservation has been made does not complete the message request in the
30 allotted time, the scheduler is configured to release the reservation and permit other users to select that previously-reserved time slot.

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Once the scheduler has been notified to reserve the time slot, the message scheduling operation is complete. Control then typically returns to display the message request home page 84 to permit the user to proceed with the ordering process.

5 Figures 15A and 15B respectively illustrate representative HTML documents 370, 380 that may be displayed in browser window 82 during interactive scheduling of a message during the sequence of operations in Fig. 14. Document 370 of Fig. 15A is typically displayed to receive the user input of a time interval, corresponding to block 342 of Fig. 14. To this extent, document 370 includes a series of date input
10 fields 372 through which a user enters a starting and ending day, month and/or year. Hour and minute ranges are respectively input through input fields 374 and 376. A “get free slots” button control 378 is used to submit the information to the sign management system, and a reset button control 379 is used to clear the information currently displayed in the input fields.

15 Document 380 of Fig. 15B is typically displayed to receive the user input of a time slot among the available time slots, corresponding to blocks 348 and 349 of Fig. 14. To this extent, document 380 includes a list box control 382 displaying the available time slots. In addition, document 380 includes input fields 384, 386 and 388 to input the date, hour and minute of a desired time slot (which may represent only a
20 portion of an available time slot). Button control 390 is used to submit the input to the sign management system, and button control 392 is used to clear the information currently displayed in the input fields.

It will be appreciated that other user input mechanisms may be used to input both time intervals and specific time slots. For example, an entire time slot could be
25 selected simply through selecting an entry in list box 382, among other operations.

Figure 16 illustrates at 400 the sequence of operations performed in selecting a proof mode in response to user selection of user interface control 92 of Fig. 4. First, at block 402, the user supplies an auto/demand selection to the system, indicating whether the user wishes to receive automatic confirmation of the display of the
30 requested message, or whether the user wishes to receive confirmation “on demand” or manually. Automatic confirmation is typically provided through the use of an e-mail sent to an e-mail address specified by the user when the message has been

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displayed and the request has been fulfilled. The "on demand" confirmation is implemented using a file transfer protocol (FTP) server that is accessible to a user to permit the user to download the confirmation anytime after the confirmation has been placed on the server after fulfillment of the message request. With this latter form of
5 confirmation, typically a user is required to input a user name and password to an FTP server to permit the confirmation to be downloaded to the user's computer. As such, it may be necessary to have the user supply the sign management system with a password that the user will be able to input to have access to the FTP server.

Once the auto/demand selection has been made by the user, a proof frame is
10 next retrieved from the user in block 404 for message requests that specify animation or multiple frames. Specifically, as discussed above, it is often desirable to provide as confirmation an image of the electronic sign displaying the message requested by the user. This provides the user with positive verification that the request was fulfilled. An enhancement of this feature is to permit a user to specify a specific frame in a
15 multi-frame message to capture for confirmation of delivery. As such, in block 404 the proof frame is retrieved from the user.

Next, in block 406, the data input by the user is stored in the order record associated with the message request. Selection of the proof mode is then complete, and the user is returned to home page 84.

20 Figure 17 illustrates a representative proof mode selection page 410 displayed in browser window 82. Page 410 includes a pair of linked radio buttons, 412, 414 through which a user selects either the automatic or manual, or on-demand proof mode. For the automatic proof mode, an input box 416 is provided for a user to submit his or her e-mail address to which the confirmation will be sent. In the
25 alternative, the user may input the e-mail address with his or her profile information at another stage of the message request generation process, whereby separate inputting of an e-mail address may not be required at this point.

Moreover, as discussed above, for multi-frame messages, it may be desirable to specify a specific frame to capture, which is received through a user interface
30 control 418. Confirmation of the input information is made through user selection of a button control 420, and a user is permitted to back out of page 410 without inputting proof information through selection of cancel button control 422.

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Figure 18 illustrates at 430 the sequence of operations performed during the selection of the payment method in response to user selection of control 94 of Fig. 4. First, as shown in block 432, a ZIP code (if within the United States) or a country is obtained from the user. Next, the address of the user is obtained in block 434. Next, 5 in block 436, a user is asked to select a payment method, in this implementation, either payment by credit card or by purchase order. If the user selects payment by credit card, control passes to block 438 to obtain credit card information from the user. If on the other hand, the user selects payment by purchase order, control passes instead to block 439 to get bank account information from the user. Once such 10 information is input, the user is returned to home page 84 of Fig. 4.

A series of suitable HTML documents 440, 450 and 462 for use in inputting method of payment information are respectively shown in greater detail in Figs. 19A-19C. Document 440 of Fig. 19A is displayed during selection of a payment method, corresponding to block 436 of Fig. 18. The method of payment may be selected, for 15 example, through a drop-down list box control 442, with confirmation of the selection made via a continue button control 444. In addition, informational text 446 may also be provided to provide instructions to the user.

Document 450 of Fig. 19B is displayed once a user has indicated that a credit card will be used as the selected payment method, corresponding to block 438 of Fig. 20 18. The type of credit card may be selected, for example, through a drop-down list box control 452, with card number and expiration date entered through input fields 454, 456. Completion of the order may be indicated via place order button control 458, with informational text 460 used to provide additional instructions to the user. In the alternative, the control button 458 may be used to return to home page 84 to 25 permit the user to separately submit the order via control button 96.

Document 460 of Fig. 19C is displayed once a user has indicated that a purchase order will be used as the selected payment method, corresponding to block 439 of Fig. 18. The user's bank account number and purchase order number may be entered through input fields 464, 466, and completion of the order may be indicated 30 via place order button control 468. Additional informational text 469 may also be included to provide instructions to the user.

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Figure 20 illustrates at 480 the sequence of operations performed in response to user selection of submit order button 96 of Fig. 4 (in the alternative, the sequence of operations can be performed responsive to selection of a "place order" button control, e.g., as shown in Figs. 19B and 19C.

5 The sequence of operations shown at 480 are performed by main control module 48. First, in block 482, order verification module 60 (Fig. 3) is called to determine whether the submitted order is suitable for processing. Then, if module 60 confirms that the order is suitable for processing, monitoring and approval module 62 (Fig. 3) is called in block 484 to determine whether the content of the message
10 specified in the order is appropriate. If so, control then passes to block 486 to submit the message to the scheduler module 64 (Fig. 3). If the scheduling operation succeeds, control passes to block 488 to debit the bank/credit card account (as appropriate), in a manner well known in the art. Next, block 490 determines whether the debit was successful. If so, control passes to block 491 to notify proof of display
15 module 68 to provide a proof of display image at the time, and optionally frame, specified in the submitted order. Next, in block 492, a confirmation email is sent to the email account specified in the order to confirm that the message has been scheduled for display. In the email, additional information, such as a summary of the order parameters and a receipt for the charge to the user's account, may also be
20 provided.

Next, as shown at block 494, the main control module waits until the message is displayed, whereby, as shown at block 496, a proof of display email is sent to the user, if that option was selected by the user during creation of the order. If not, no such email is sent. It should be appreciated that waiting for the message to be
25 displayed need not positively executed by main control module 48, rather, the main control module may terminate handling of the order at block 492, and then execute block 496 asynchronously after notification from another module in the sign management system (e.g., either of modules 64, 68). Also, as illustrated in blocks 482, 484, 486 and 490, if any of modules 60, 62 or 64 return a negative result, or if
30 the debit operation is unsuccessful, control instead passes to block 498 to cancel the order and notify the user of the cancellation thereof.

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The operation of order verification module 60 is illustrated by order verification routine 500 in Fig. 21. First, in block 502, the availability of the selected time slot for the order is verified by accessing scheduler module 64 (Fig. 3). If the selected time slot is still available, the message parameters are compared with the capabilities of the selected sign in block 504 to determine whether the message parameters are compatible (including accessing the sign capabilities stored in database 58 (Fig. 3).

If the message is compatible, control passes to block 506 to verify that the message context is appropriate — that is, whether the content of the message is compatible with the message display service provider. As but one example, a message advertising a particular product should not be displayed on an electronic sign owned by a competitor. Also, a message espousing a particular political view may not be acceptable to a particular message display service provider. Thus, it may be desirable to permit a sign's capabilities to include a list of terms that are inappropriate for display on the sign. As a result, block 506 may be implemented by performing a search to locate any inappropriate terms.

Assuming the message context is appropriate, control next passes to block 508 to verify whether the user's address is legal, e.g., by checking that all address components are provided, that the ZIP code exists, that the city and state match that assigned to the ZIP code, and/or that the street address exists and is located in the ZIP code, among others. If so, control then passes to block 510 to determine whether the credit card/bank account supplied by the user is valid (e.g., by accessing the appropriate credit agency or bank, in a manner known in the art). If so, the order is verified, as represented at block 512, and a "valid" response is returned from module 60). However, if any of blocks 502-510 return a "fail" result, this result is output from module 60, as represented at block 514.

The operation of monitoring and approval module 62 is illustrated by monitoring & approval routine 520 in Fig. 22. First, in block 522, the configuration of the sign is retrieved from database 58. Next, in block 524, it is determined whether the message is configured for monitoring and approval, which depends upon factors such as the specific electronic sign, where the electronic sign is located, what

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audience is expected to view the electronic sign, and who is expected to post messages to the electronic sign.

Assuming first that the message is configured for monitoring and approval, control passes to block 526 to determine whether the message includes text. If so, control passes to block 528 to perform automatic searching for forbidden words/characters, e.g., using any conventional parental/content filtering algorithms known in the art. In addition, at block 529, it is determined whether an additional, manual review of the text in the message is required. If so, control passes to block 532 to notify an administrator to obtain manual review and approval of the message content. Control then passes to block 534 to determine whether the message content is approved. Otherwise, if no manual review of the text is required, block 529 passes control to block 530 to determine whether the message includes graphics. Moreover, returning to block 526, if no text is included in the message, control also passes to block 530 to continue processing of the message.

If the message does include graphics, control also passes to block 532 to notify an administrator to obtain manual review and approval of the message content. Then, after receiving manual review, or if no graphics are included in the message, control passes to block 534 to determine whether the message content is approved. If so, a "pass" result is returned, as represented by block 536. If not, a "fail" result is returned, as represented by block 538. Also, returning to block 524, if the message is not configured for monitoring and approval, control passes directly to block 536. In the alternative, content monitoring may be omitted, or may always be performed regardless of the electronic sign. It should also be appreciated that any other combination of automated and/or manual review may be utilized in other embodiments consistent with the invention.

The operation of scheduler module 64 is illustrated by scheduler routine 570 in Fig. 23. Scheduler routine 570 is illustrated as an event-driven routine, waiting for events in block 572, and detecting received events at blocks 574-580. Moreover, as shown in block 582, the scheduler routine periodically checks a message queue and submits any pending message to the appropriate sign controller for the electronic sign selected for that message. Moreover, as is known in the art, each sign controller typically includes scheduling capabilities such that submission of a message to the

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sign controller, as well as a specific time slot to display that message (using the controller-specific control signals provided by the sign control driver 66 for that sign), is sufficient to ensure that the message will be displayed at the appropriate time. In the alternative, scheduling capabilities may be incorporated directly into scheduler module 64, rather than relying on the capabilities provided by conventional sign controllers.

One type of event handled by scheduler routine 570 is a request to determine the availability of a particular sign over a particular time interval. Such an event is detected in block 574 and handled in block 590 by determining whether the specified sign is available at the time specified in the event. Such information is returned to the main control module, also including the specific time slots that are available within the specified time interval. The information is determined by accessing a message queue maintained within the scheduler module 64. In the alternative, the information can be determined by accessing a local message queue maintained in the appropriate sign controller.

Another type of event handled by scheduler routine 570 is a reserve time slot event, which is detected in block 576 and handled in block 592 by blocking out the specified time slot for the specified user, typically to give the user time to complete the creation of an order. In addition, a reservation timer (e.g., one hour) is set. By doing so, the time slot is made temporarily unavailable to other users until the timer expires. Expiration of a timer is detected in block 578 and handled in block 594 by clearing the previously-set block, thereby freeing the reserved time slot for selection by other users. Another type of event handled by scheduler routine 570 is a message submitted event, which is detected in block 580 and handled in block 596 by adding the message to the message queue maintained in the scheduler module. Doing so also clears the reservation timer, with the block being replaced by the new message.

The operation of proof of display module 68 is shown at 620 in Fig. 24. Module 68 may be located within a server computer (as shown in Fig. 3), or in the alternative, located within a sign controller and/or remote electronic device coupled to an image capture device. First, as shown at block 622, a snapshot of the electronic sign is captured on a periodic basis (e.g., n times a second), in a manner known in the art. Next, as shown at block 624, the last captured snapshot is forwarded to the main

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control module in response to a request made by such module. Next, it is determined in block 626 whether a previously-stored proof of display time was reached — that is, whether a proof of delivery time specified in a particular message request has been reached. If so, control passes to block 628 to store the snapshot in a file transfer
5 protocol (FTP) account accessible by the user that created the message to provide proof of delivery therefor. In addition, block 628 may also notify the main control module that the snapshot has been stored, so that the main control module may forward a proof of delivery email to the user if the user had requested such.

Upon completion of block 628, or if no proof of display time has been
10 reached, control passes to block 630 to determine whether a new proof of display time has been forwarded from the main control module (e.g., at block 491 of Fig. 20). If not, control returns to block 622. If so, however, the proof of display time is stored for watching by module 68. Control then returns to block 622.

As discussed above, it may be desirable in certain implementations to
15 distribute sign management functions among a plurality of server computers coupled to one another via a private and/or public communications link. As shown in Fig. 25, for example, a sign management system 700 is shown including a global sign management system gateway 702 coupled to a plurality of sign managers 704 over the Internet 34. It is anticipated that a user may log on and authenticate to any sign
20 manager 704 in the manner discussed above. In the alternative, the user may register with the global sign management system gateway 702 to select among a plurality of available signs distributed among the various sign managers. Through this architecture, a user is able to select among a larger of available signs, and have the distribution of a message request transmitted to the appropriate sign manager for
25 handling. Moreover, the complete ordering process may be handled by gateway 702, with the completed order sent to the various sign managers 704 as appropriate. In the alternative, only a portion of the message request ordering process may be handled by gateway 702, with the user transferred to the appropriate sign manager to complete the order.

30 For example, as shown at Fig. 26, the sequence of operations in directing a message request to a particular sign manager are illustrated at 710. First, after a user accesses the gateway 702, the user is permitted to select globally among a plurality of

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available signs available through the sign management system, as shown at block 712.

As a component of this operation, it may be necessary for the gateway to transmit availability requests to the various sign managers and retrieve availability information from each sign manager. Moreover, a preview function may also require the

5 interaction between the gateway and the respective sign managers.

Next, as shown in block 714, the user is directed to the home page of the selected sign manager. Moreover, it may be desirable to notify that sign manager of the sign that was selected by the user. In the alternative, the sign manager may not be informed of the specific sign requested by the user, whereby the user would be

10 required to select that sign again as discussed above in connection with Fig. 5. In this latter implementation, the gateway may be as simple as a sequence of HTML documents through which a user can search for different signs at different locations, with the selection of any of those signs and/or locations used to simply direct the user to the particular sign manager for an operation principally in the manner discussed
15 above for sign management system 10. In the alternative, however, a greater deal of interactivity may be provided between gateway 702 and each sign manager 704 to facilitate the streamlined processing of message requests throughout system 700.

As shown at block 716, once the user is routed to the home page of the selected sign manager, that sign manager then permits the user to log in in the manner
20 described above. Then, as shown at block 718, the order process is continued, e.g., by displaying message request home page 84 of Fig. 4 and permitting order selection through the process described above.

Alternate manners of distributing the functionality of a global sign management system between a gateway and individual sign managers may be used in
25 the alternative. Therefore, the invention should not be limited to the particular distribution or allocation of functionality as described herein.

It should be appreciated that additional functions may be supported by a sign management system consistent with the invention. For example, a user may be able to obtain general background information about the sign management system and its
30 operation. Moreover, a sign management system may permit message display service providers to obtain information about how to purchase the system and/or how to contract for the services of an existing sign management system. An interactive

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manner of ordering service and/or sign management system may also be provided. Also, a user may be able to retrieve descriptive information about a particular sign during the selection process thereof. Further, a user may be permitted to have an account in the sign management system and to retrieve previously-prepared messages on a recurring basis. Also, a message display service provider may also be able to obtain statistical information regarding the orders placed to his or her owned electronic sign.

Moreover, a user may have access (after authorization) to an FTP account to retrieve proof of display images. Furthermore, a user may be permitted to purchase proof of display images, e.g., as a memento of the purchase of the message. A value added service, for example, may include mailing a framed copy of a proof of display image to a message recipient (e.g., a person whose birthday was announced in a message). Other uses for proof of display images will be envisioned by one of ordinary skill in the art having benefit of the instant disclosure.

As an additional alternative, it may be desirable to support audio capabilities in connection with the display of a message on an electronic sign, e.g., including a voice message, background music, sound effects, etc. Audio may be a component of a video clip, or may be a separate multimedia object associated with the message. Handling of audio may be handled in any number of manners, e.g., similar to the manner described herein for editing, selecting, and processing image, animation, and video multimedia components of a message.

Other modifications will be apparent to one of ordinary skill in the art. Therefore, the invention lies in the claims hereinafter appended.

What is claimed is:

- 1 1. A method of controlling an electronic sign, the method comprising:
 - 2 (a) accepting electronic message requests from a plurality of
 - 3 independent users over an electronic communications link, each electronic
 - 4 message request associated with a selected message and a selected time to
 - 5 display the selected message; and
 - 6 (b) processing received electronic message requests to generate
 - 7 control signals for use in electronically controlling an electronic sign.
- 1 2. The method of claim 1, wherein the electronic sign is selected from the
- 2 group consisting of a light emitting diode (LED) sign, a liquid crystal display (LCD)
- 3 sign, a plasma display sign, a cathode ray tube (CRT) sign, a bulb sign, and a flip dot
- 4 sign.
- 1 3. The method of claim 1, further comprising transmitting the control signals
- 2 to the electronic sign over a communications medium selected from the group
- 3 consisting of a direct cable, a radio frequency (RF) transmission, a telephone line, an
- 4 infrared (IR) transmission, and a computer network cable.
- 1 4. The method of claim 1, further comprising, responsive to receipt of an
- 2 electronic message request, debiting a user account using payment information
- 3 associated with the electronic message request.
- 1 5. The method of claim 1, wherein accepting electronic message requests
- 2 from the plurality of users includes accepting data for the electronic message requests
- 3 over a public communications network.
- 1 6. The method of claim 1, further comprising transmitting the control signals
- 2 to the electronic sign over a public communications network.
- 1 7. The method of claim 1, wherein each electronic message request is further
- 2 associated with a selected electronic sign among a plurality of electronic signs, the

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3 method further comprising, responsive to a first electronic message request,
4 transmitting a control signal to a first electronic sign from the plurality of electronic
5 signs associated with the first electronic message request.

1 8. The method of claim 7, wherein accepting electronic message requests
2 from a plurality of users includes interacting with a first user through an on-line
3 interactive interface.

1 9. The method of claim 8, wherein interacting with the first user includes:
2 (a) receiving a sign search criteria from the first user;
3 (b) determining a subset of matching electronic signs from the
4 plurality of electronic signs that match the sign search criteria; and
5 (c) associating at least one electronic sign from the subset of matching
6 electronic signs with the first electronic message request.

1 10. The method of claim 9, wherein interacting with the first user further
2 includes identifying the electronic signs in the subset of matching electronic signs to
3 the first user, wherein associating the electronic sign with the first electronic message
4 request is performed responsive to user selection of at least one electronic sign from
5 the subset of matching electronic signs.

1 11. The method of claim 9, wherein receiving the sign search criteria includes
2 receiving at least one of a location criteria, a time criteria, and a display capability
3 criteria from the first user.

1 12. The method of claim 8, wherein interacting with the first user further
2 includes:
3 (a) transmitting availability information for at least one electronic sign
4 to a user, the availability information identifying a plurality of available time
5 slots for the electronic sign;
6 (b) receiving a user selection of a selected time slot from the plurality
7 of available time slots; and

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8 (c) associating the selected time slot with the first electronic message
9 request.

1 13. The method of claim 8, wherein interacting with the first user further
2 includes receiving user input defining a first message.

1 14. The method of claim 13, wherein interacting with the first user further
2 includes generating a computer simulation of a display of the first message on the first
3 electronic sign.

1 15. The method of claim 13, wherein interacting with the first user further
2 includes constraining user input defining the first message based upon a display
3 capability of the first electronic sign.

1 16. The method of claim 15, wherein interacting with the first user further
2 includes:

3 (a) receiving user input to associate a second electronic sign with the
4 first electronic message request instead of the first electronic sign; and

5 (b) responsive thereto, converting at least on display characteristic of
6 the first message based upon a display capability of the second electronic sign.

1 17. The method of claim 13, wherein interacting with the first user further
2 includes:

3 (a) transmitting available content information to a user, the available
4 content information identifying a plurality of available message components
5 available for display on an electronic sign;

6 (b) receiving a user selection of a selected message component from
7 the plurality of available message components; and

8 (c) associating the selected message component with the first
9 electronic message request.

- 1 18. The method of claim 13, wherein interacting with the first user further
2 includes:
- 3 (a) transmitting available effect information to a user, the available
4 effect information identifying a plurality of available message effects available
5 for use in displaying a message on an electronic sign;
6 (b) receiving a user selection of a selected message effect from the
7 plurality of available message effects; and
8 (c) associating the selected message effect with the first electronic
9 message request.
- 1 19. The method of claim 13, wherein receiving user input defining the first
2 message includes receiving message information selected from the group consisting
3 of text information, image information, message effect information, animation
4 information, video information, and combinations thereof.
- 1 20. The method of claim 8, wherein interacting with the first user includes
2 selecting an electronic sign among the plurality of electronic signs with which to
3 associate with the first electronic message request, including:
- 4 (a) in response to first user input, capturing and transmitting to the
5 first user a current image of a first electronic sign among the plurality of
6 electronic signs;
7 (b) in response to second user input, associating the first electronic
8 sign with the first electronic message request.
- 1 21. The method of claim 8, wherein interacting with the first user includes
2 transmitting at least one platform independent document to the first user.
- 1 22. The method of claim 21, wherein the platform independent document is
2 formatted in hypertext markup language (HTML).
- 1 23. The method of claim 8, wherein interacting with the first user includes:
2 (a) determining a platform associated with the first user; and

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3 (b) transmitting a platform specific program to the first user based
4 upon the platform associated therewith.

1 24. The method of claim 1, further comprising verifying a first electronic
2 message request prior to generating a control signal for use in electronically
3 controlling the electronic sign responsive to the electronic message request.

1 25. The method of claim 24, wherein verifying the first electronic message
2 request includes at least one of verifying availability of a first time associated with the
3 first electronic message request, verifying compatibility of a first message associated
4 with the first electronic message request with a display capability of the electronic
5 sign, verifying a payment associated with the first electronic message request, and
6 verifying content-appropriateness of the first message.

1 26. The method of claim 1, further comprising verifying content-
2 appropriateness of a message request prior to generating a control signal for use in
3 electronically controlling the electronic sign responsive to the message request.

1 27. The method of claim 1, further comprising confirming acceptance of a
2 first electronic message request from a first user.

1 28. The method of claim 27, wherein confirming acceptance of the first
2 electronic message request includes transmitting an electronic message to the first
3 user.

1 29. The method of claim 1, further comprising:
2 (a) displaying on the electronic sign a first message associated with a
3 first electronic message request from a first user; and
4 (b) capturing an image of the electronic sign during display of the first
5 message with an image capture device.

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1 30. The method of claim 29, wherein the image capture device includes a
2 digital camera positioned at a location suitable for viewing the electronic sign.

1 31. The method of claim 29, further comprising confirming display of the first
2 message on the electronic sign by forwarding the image to the first user.

1 32. The method of claim 31, wherein forwarding the image to the first user
2 includes transmitting the image in an electronic message to the first user.

1 33. The method of claim 31, wherein forwarding the image to the first user
2 includes:
3 (a) obtaining authorization information from the first user; and
4 (b) thereafter transmitting the image to the first user.

1 34. The method of claim 29, wherein the first message includes a plurality of
2 frames, and wherein capturing the image of the electronic sign includes capturing the
3 image during display of a selected frame among the plurality of frames.

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- 1 35. A method of controlling an electronic sign, the method comprising:
- 2 (a) receiving a plurality of electronic message requests from a plurality
- 3 of independent sources over a public communications network, each electronic
- 4 message request associated with a selected message;
- 5 (b) scheduling the plurality of electronic message requests; and
- 6 (c) generating control signals for use in electronically controlling an
- 7 electronic sign to display the selected messages associated with the plurality of
- 8 electronic message requests.

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- 1 36. A method of vending advertising space on an electronic sign, the method
2 comprising:
- 3 (a) interacting with a plurality of users through an on-line computer
4 interface to generate a plurality of electronic orders, with each electronic order
5 specifying a selected message, a selected time at which to display the selected
6 message, and payment information identifying a selected manner of payment
7 for the display of the selected message on the electronic sign;
- 8 (b) processing each electronic order to schedule display of the selected
9 message associated therewith on the electronic sign;
- 10 (c) processing each electronic order to handle payment for display of
11 the selected message associated therewith; and
- 12 (d) transmitting control signals to the electronic sign so as to control
13 the electronic sign to display the selected message associated with each
14 electronic order at the selected time therefor.

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1 37. An apparatus, comprising:

2 (a) an on-line user interface configured to accept electronic message
3 requests from a plurality of users over an electronic communications link, each
4 electronic message request associated with a selected message and a selected
5 time to display the selected message; and

6 (b) a sign manager, operably coupled to the on-line user interface to
7 electronically receive electronic message requests therefrom, the sign manager
8 configured to process received message requests and generate therefrom at
9 least one control signal for use in electronically controlling an electronic sign.

1 38. The apparatus of claim 37, wherein the electronic sign is selected from the
2 group consisting of a light emitting diode (LED) sign, a liquid crystal display (LCD)
3 sign, a plasma display sign, a cathode ray tube (CRT) sign, a bulb sign and a flip dot
4 sign.

1 39. The apparatus of claim 37, wherein the sign manager is operably coupled
2 to the electronic sign via a communications medium selected from the group
3 consisting of a direct cable, a radio frequency (RF) transmission, a telephone line, an
4 infrared (IR) transmission, and a computer network cable.

1 40. The apparatus of claim 37, wherein the sign manager is further configured
2 to debit a user account using payment information associated with an electronic
3 message request.

1 41. The apparatus of claim 37, wherein the on-line user interface is configured
2 to accept electronic message requests from at least one of the plurality of users over a
3 public communications network.

1 42. The apparatus of claim 37, wherein the sign manager is coupled to the
2 electronic sign over a public communications network.

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1 43. The apparatus of claim 37, wherein the sign manager is coupled to a
2 plurality of electronic signs, and wherein the on-line user interface is configured to
3 receive a selected electronic sign among the plurality of electronic signs with which to
4 associate an electronic message request.

1 44. The apparatus of claim 43, wherein the on-line user interface is configured
2 to provide the first user with a subset of matching electronic signs matching a sign
3 search criteria input by the first user.

1 45. The apparatus of claim 44, wherein the sign search criteria includes at
2 least one of a location criteria, a time criteria, and a display capability criteria.

1 46. The apparatus of claim 43, wherein the on-line user interface is further
2 configured to display to the first user a current image of a first electronic sign among
3 a plurality of electronic signs during user selection of an electronic sign with which to
4 associate an electronic message request.

1 47. The apparatus of claim 37, wherein the on-line user interface is configured
2 to provide the first user with availability information that identifies a plurality of
3 available time slots for the electronic sign.

1 48. The apparatus of claim 37, wherein the on-line user interface is further
2 configured to generate a computer simulation of a display of the first message on the
3 electronic sign.

1 49. The apparatus of claim 37, wherein the on-line user interface is further
2 configured to receive user input defining the first message selected from the group
3 consisting of text information, image information, message effect information,
4 animation information, video information, and combinations thereof.

1 50. The apparatus of claim 37, wherein the on-line user interface is configured
2 to interact with the first user by transmitting at least one HTML document to the first
3 user.

1 51. The apparatus of claim 37, wherein the sign manager is further configured
2 to verify a first electronic message request prior to generating a control signal for use
3 in electronically controlling the electronic sign responsive to the first electronic
4 message request, by performing at least one of verifying availability of a first time
5 associated with the first electronic message request, verifying compatibility of a first
6 message associated with the first electronic message request with a display capability
7 of the electronic sign, verifying a payment associated with the first electronic message
8 request, and verifying content-appropriateness of the first message.

1 52. The apparatus of claim 37, wherein the sign manager is further configured
2 to verify content-appropriateness of a message request prior to generating a control
3 signal for use in electronically controlling the electronic sign responsive to the
4 message request.

1 53. The apparatus of claim 37, wherein the sign manager is further configured
2 to confirm acceptance of a first electronic message request by transmitting an
3 electronic message to the first user.

1 54. The apparatus of claim 37, further comprising an image capture device
2 positioned at a location suitable for viewing the electronic sign, and wherein the sign
3 manager is further configured to store an image of the electronic sign during display
4 of a first message associated with a first electronic message request from a first user.

1 55. The apparatus of claim 54, wherein the sign manager is further configured
2 to forward the image to the first user to confirm display of the first message on the
3 electronic sign.

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1 56. The apparatus of claim 55, wherein the sign manager is further configured
2 to transmit the image in an electronic message to the first user.

1 57. The apparatus of claim 54, wherein the first message includes a plurality
2 of frames, and wherein the sign manager is further configured to store an image taken
3 during display of a selected frame among the plurality of frames.

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- 1 58. A program product, comprising:
- 2 (a) a program including an on-line user interface configured to accept
- 3 electronic message requests from a plurality of users over an electronic
- 4 communications link, each electronic message request associated with a
- 5 selected message and a selected time to display the selected message; and a
- 6 sign manager, operably coupled to the on-line user interface to electronically
- 7 receive electronic message requests therefrom, the sign manager configured to
- 8 process received message requests and generate therefrom at least one control
- 9 signal for use in electronically controlling an electronic sign; and
- 10 (b) a signal bearing media bearing the program.

- 1 59. The program product of claim 58, wherein the signal bearing media
- 2 includes at least one of a transmission type media and a recordable media.

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- 1 60. An apparatus, comprising:
- 2 (a) an image capture device positioned at a location suitable for
- 3 viewing an electronic sign; and
- 4 (b) a sign manager operably coupled to electronically control both the
- 5 image capture device and the electronic sign.

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- 1 61. A method of confirming display of a message on an electronic sign, the
2 method comprising:
- 3 (a) capturing an image of the electronic sign during display of the
4 message using an image capture device positioned at a location suitable for
5 viewing the electronic sign; and
- 6 (b) transmitting the image to a location remote from the electronic
7 sign.

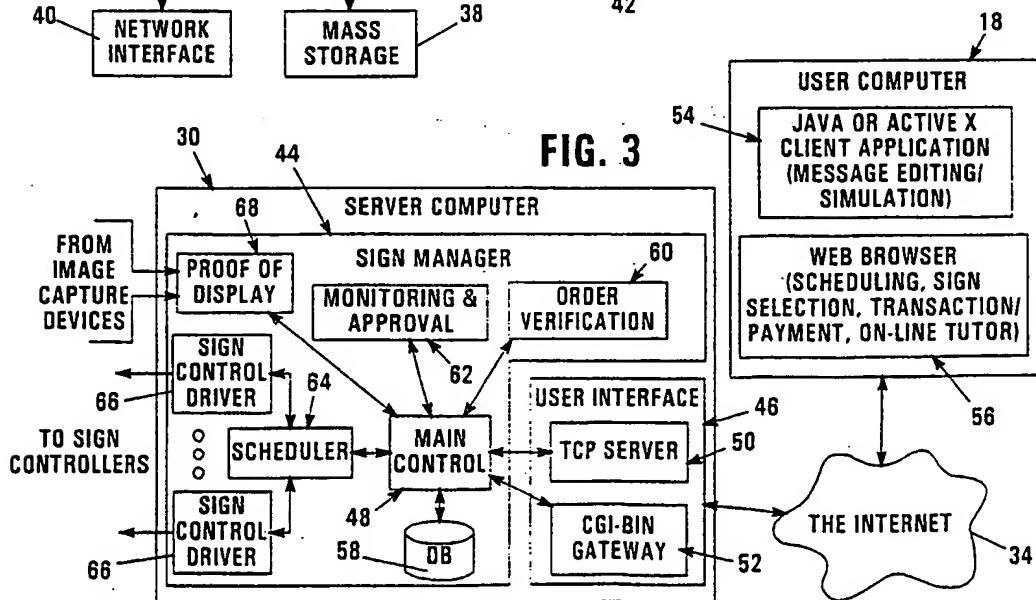
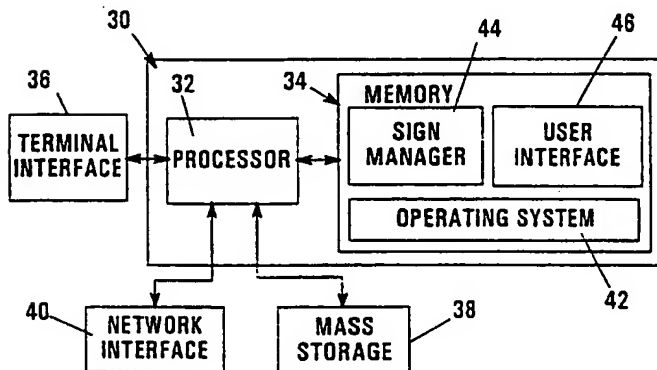
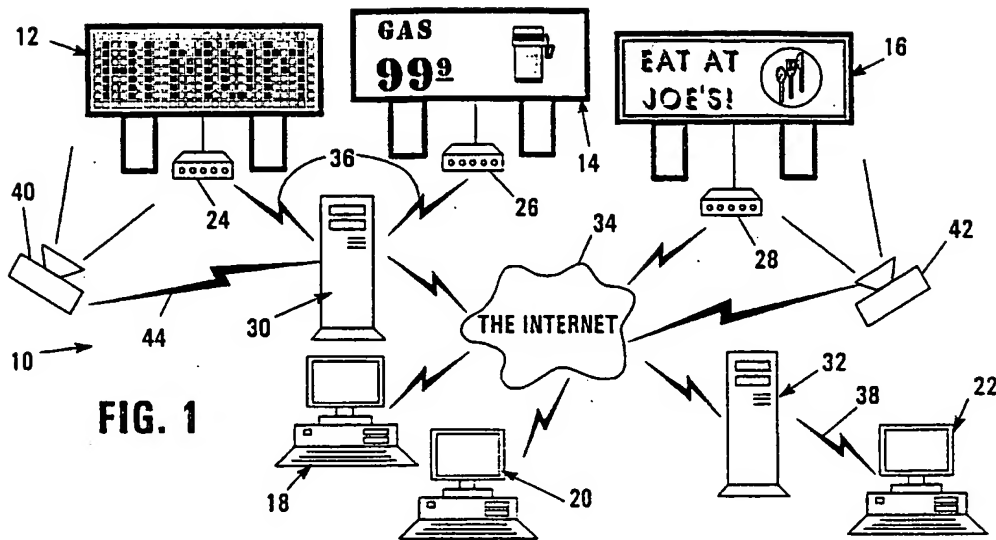
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- 1 62. A method of generating a message for display on an electronic sign, the
2 method comprising:
3 (a) transmitting a current image of at least one of a plurality of
4 electronic signs to a user; and
5 (b) receiving a user selection of at least one of the plurality of
6 electronic signs.

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- 1 63. A method of generating a message for display on an electronic sign, the
2 method comprising:
- 3 (a) constructing a message in response to input from a user; and
 - 4 (b) generating a computer simulation of a display of the message on
5 the electronic sign; and
 - 6 (c) displaying the computer simulation to the user that is constructing
7 the message.

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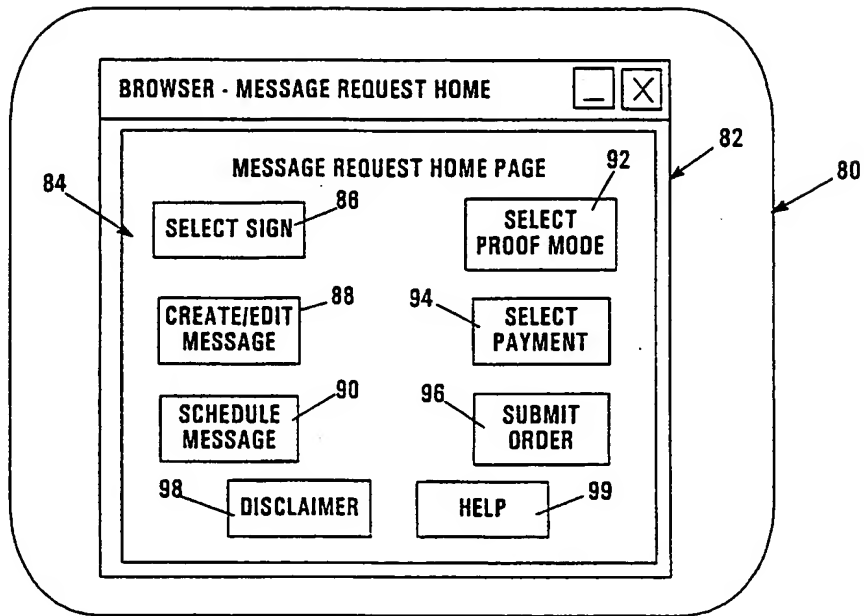


FIG. 4

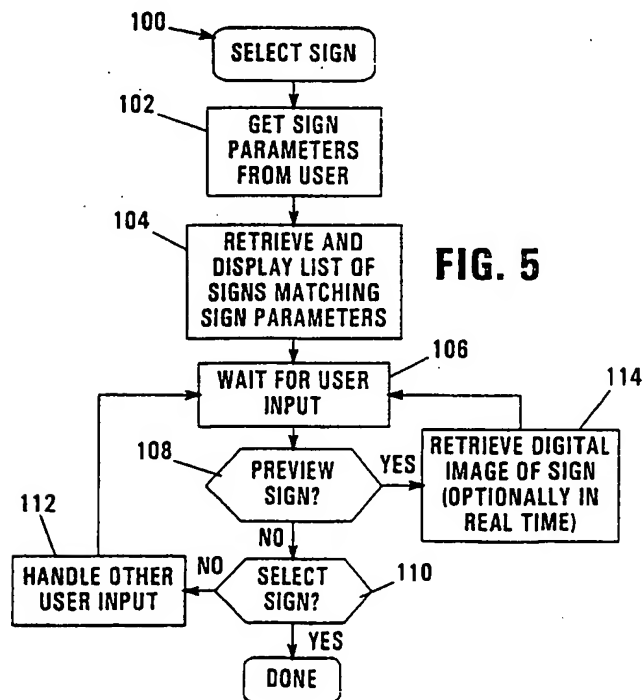


FIG. 5

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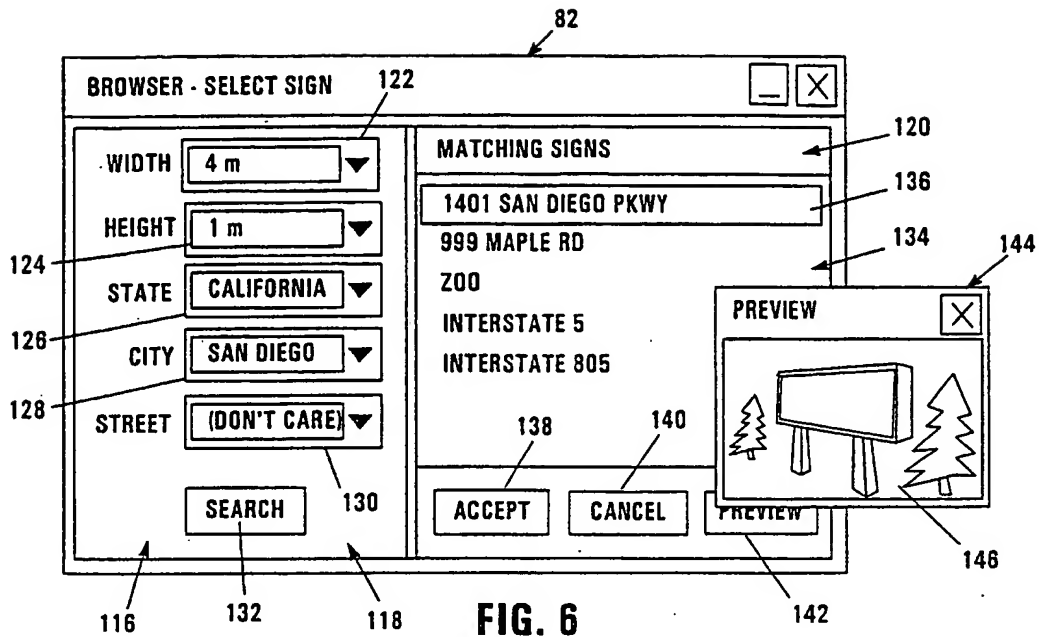


FIG. 6

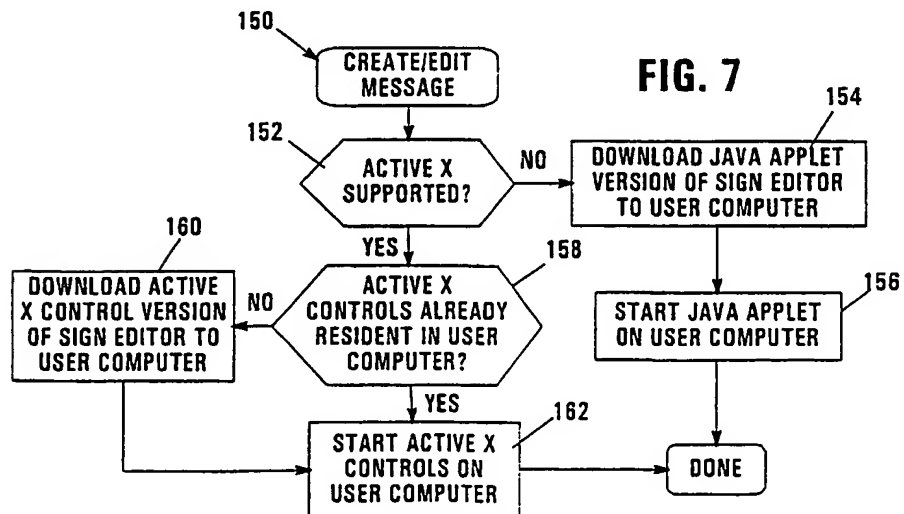
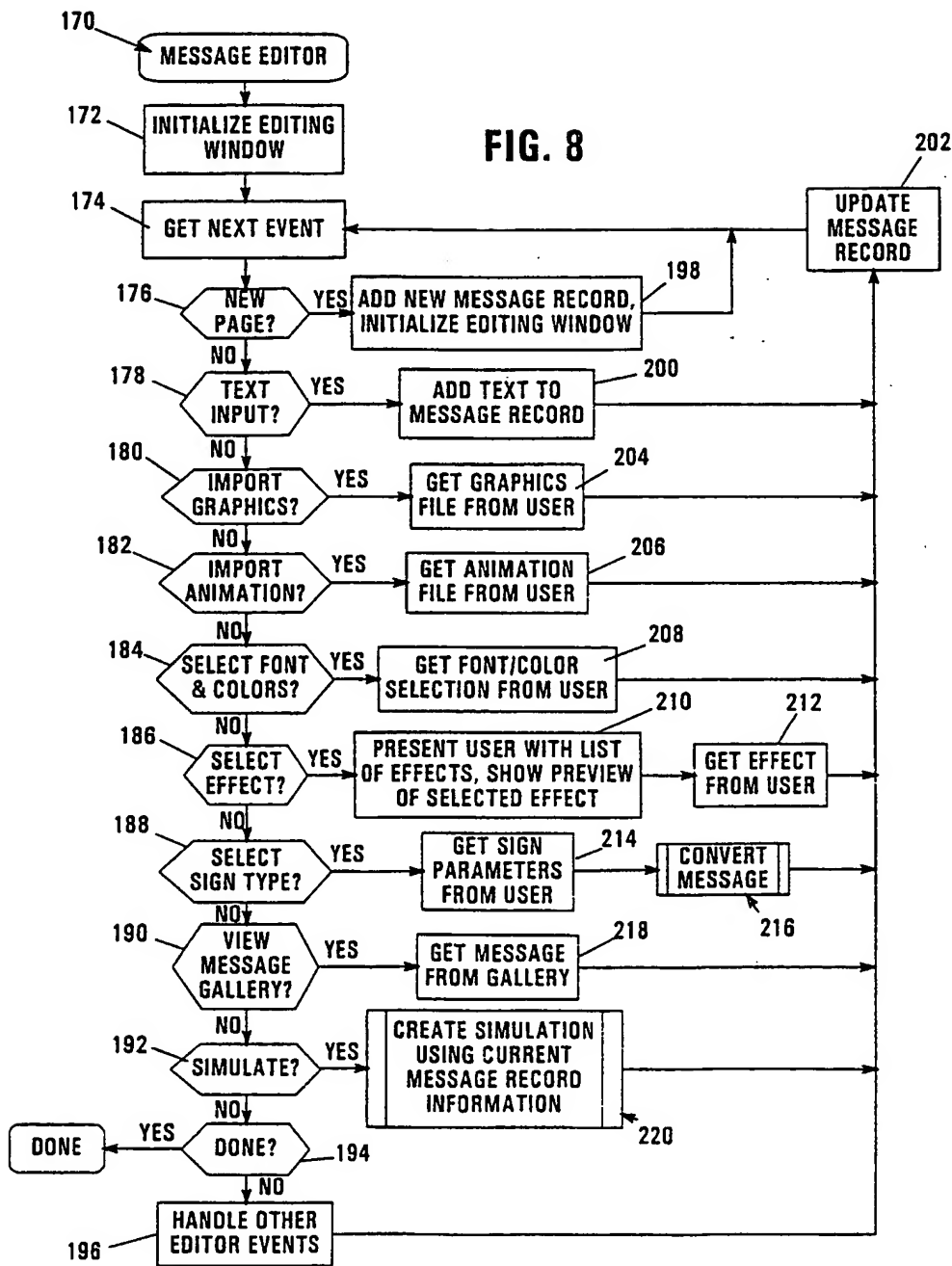


FIG. 7

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FIG. 8



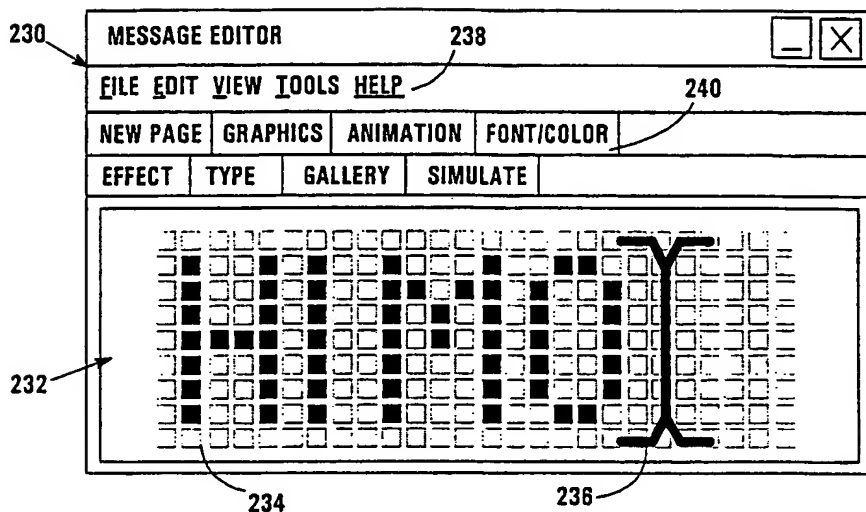
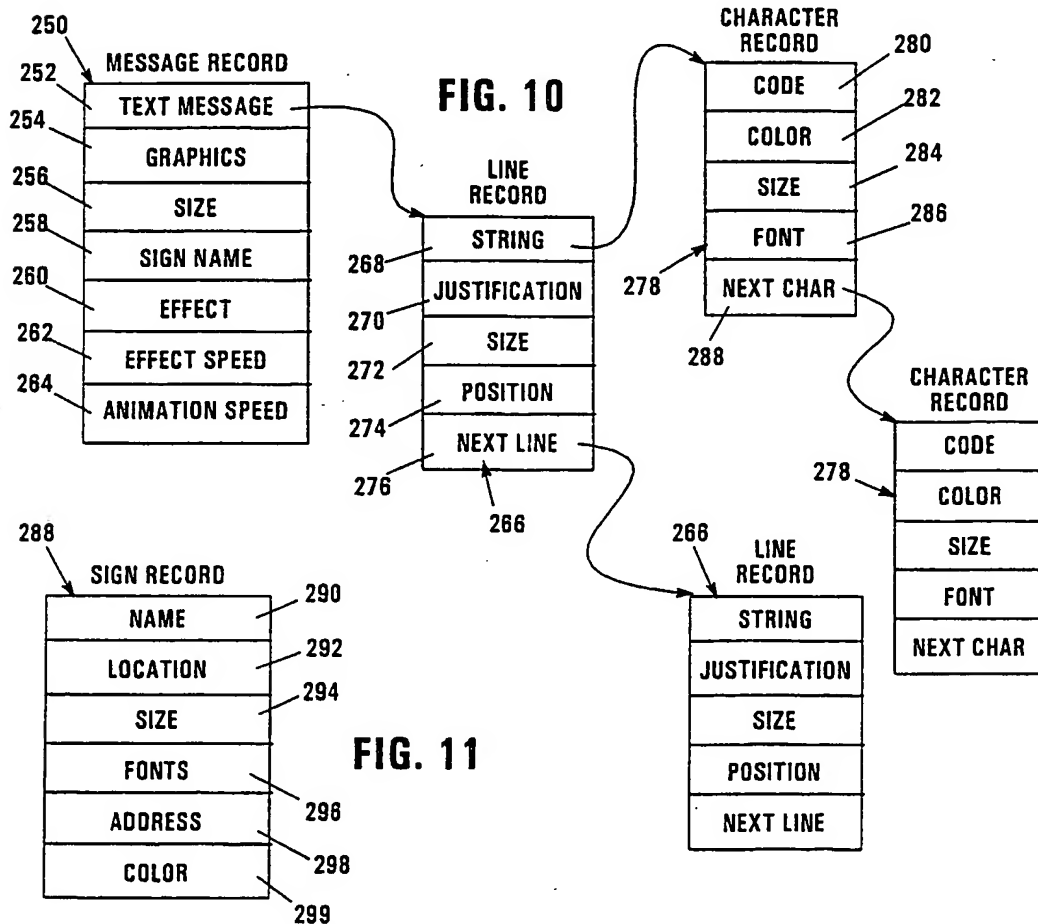


FIG. 9



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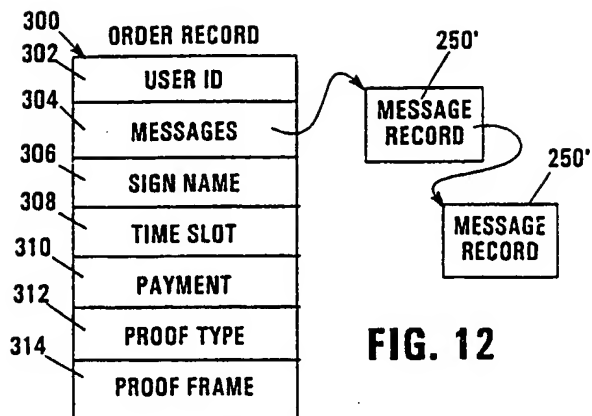


FIG. 12

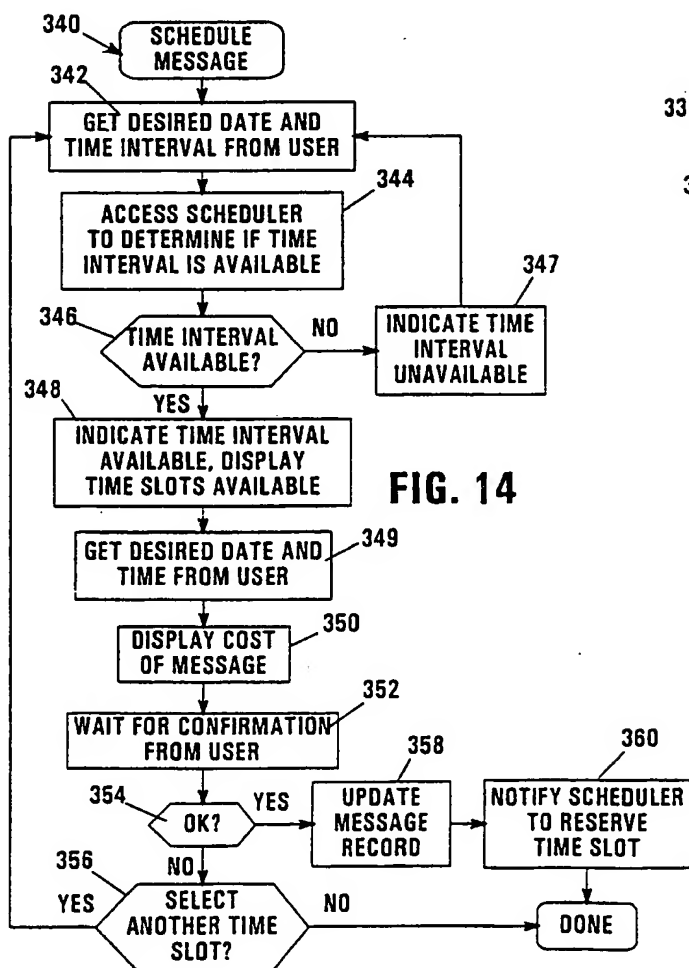


FIG. 14

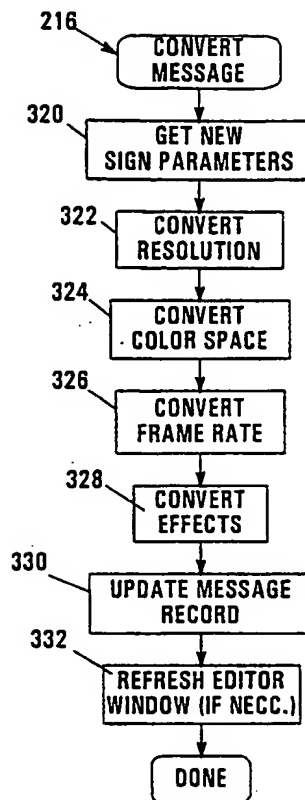
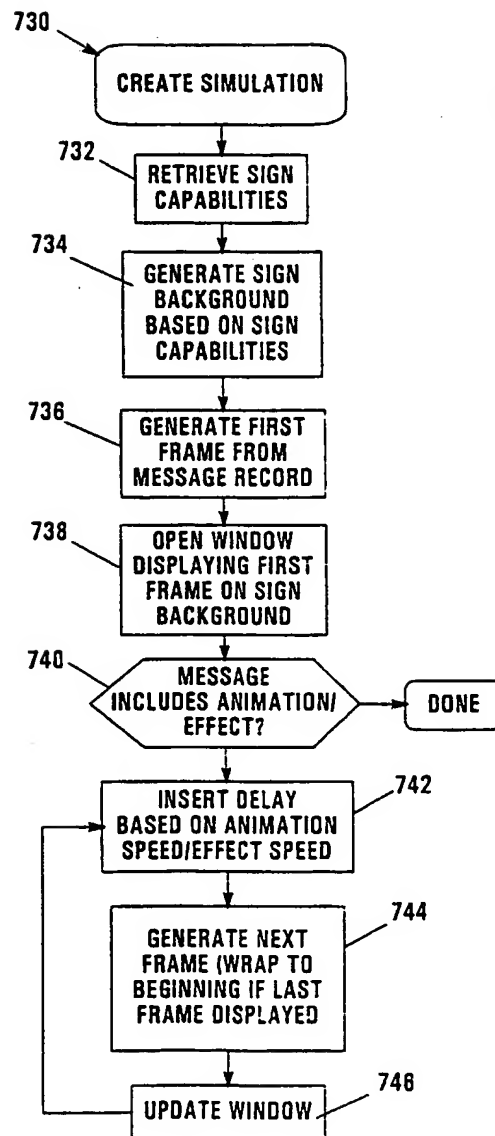


FIG. 13A

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FIG. 13B



BROWSER - MESSAGE SCHEDULING

SELECT TIME INTERVAL

DATE FROM / / TO / /

HOUR FROM TO

MINUTE FROM TO

FIG. 15A

BROWSER - MESSAGE SCHEDULING

AVAILABLE TIME SLOTS

MON 29/03/99 09:25 - MON 29/03/99 10:10
 MON 29/03/99 12:30 - MON 29/03/99 13:40
 WED 31/03/99 11:55 - WED 31/03/99 12:30

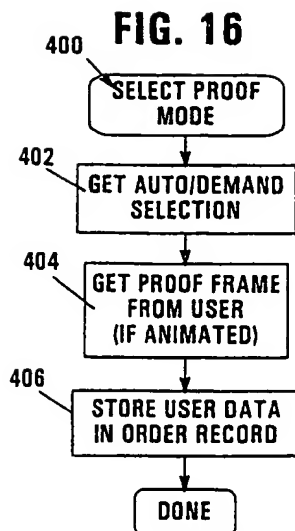
SELECT TIME SLOT

DATE FROM / / TO / /

HOUR FROM TO

MINUTE FROM TO

FIG. 15B



BROWSER - PROOF MODE

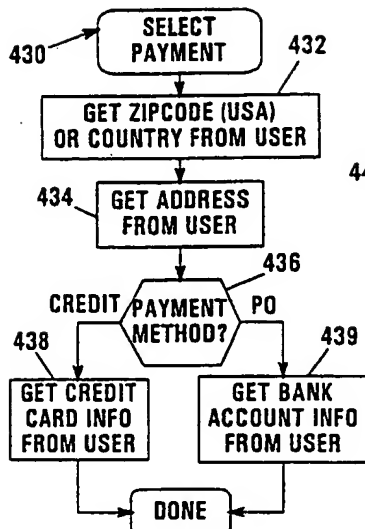
PROOF MODE

☐ AUTOMATIC - EMAIL:

☒ MANUAL

FRAME TO CAPTURE:

FIG. 17



BROWSER - METHOD OF PAYMENT

PAYMENT METHOD:

PLEASE NOTE: YOUR ORDER WILL NOT BE PROCESSED UNTIL YOU HAVE INPUT YOUR CREDIT CARD OR ACCOUNT NUMBER AND CLICKED ON THE "PLACE ORDER" BUTTON IN THE LAST STEP

FIG. 19A

FIG. 19B

BROWSER - METHOD OF PAYMENT

CARD TYPE

CARD NUMBER

EXPIRATION DATE /

TO PLACE YOUR ORDER, COMPLETE YOUR CREDIT CARD INFORMATION BELOW. THEN CLICK THE "PLACE ORDER" BUTTON AND YOUR ENCRYPTED ORDER WILL BE PROCESSED

BROWSER - METHOD OF PAYMENT

ACCOUNT NUMBER

PO NUMBER

FOR YOUR PROTECTION, WE DO NOT AUTOMATICALLY ENTER YOUR ACCOUNT NUMBER. ONCE YOU HAVE ENTERED THE INFORMATION INTO THE FORM BELOW, HIT THE "PLACE ORDER" BUTTON, AND YOUR ENCRYPTED ORDER WILL BE SENT

FIG. 19C

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FIG. 20

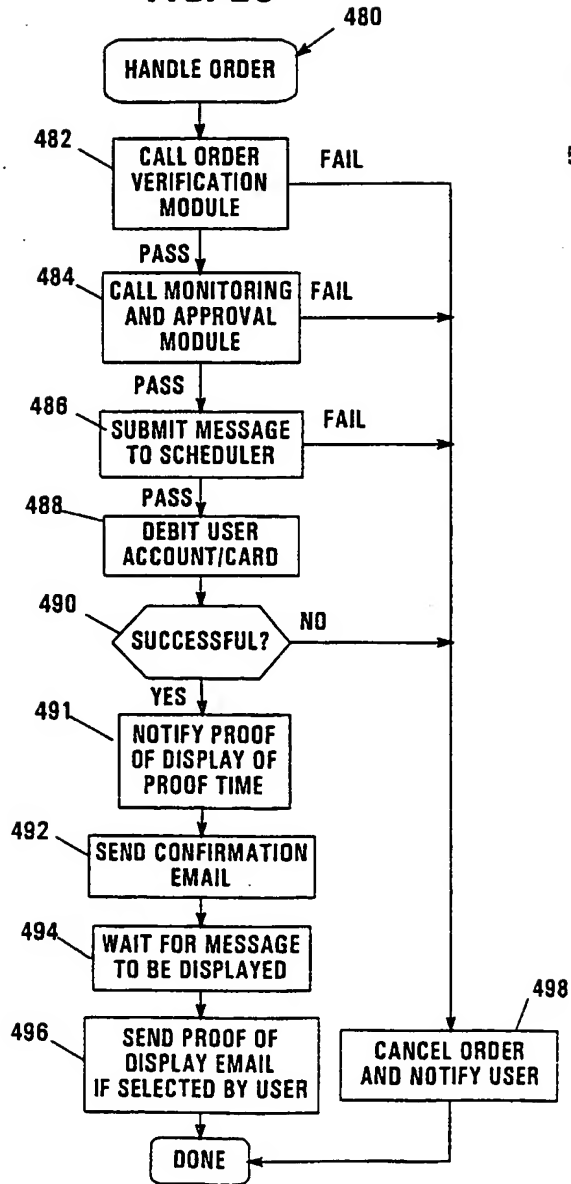
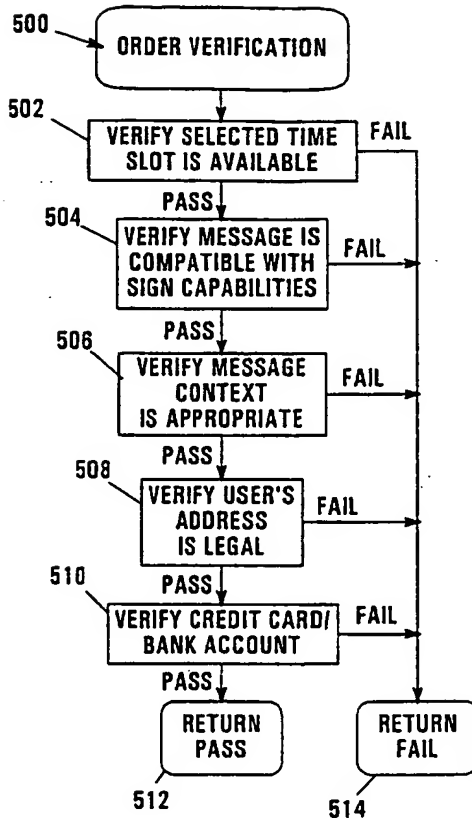


FIG. 21



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FIG. 22

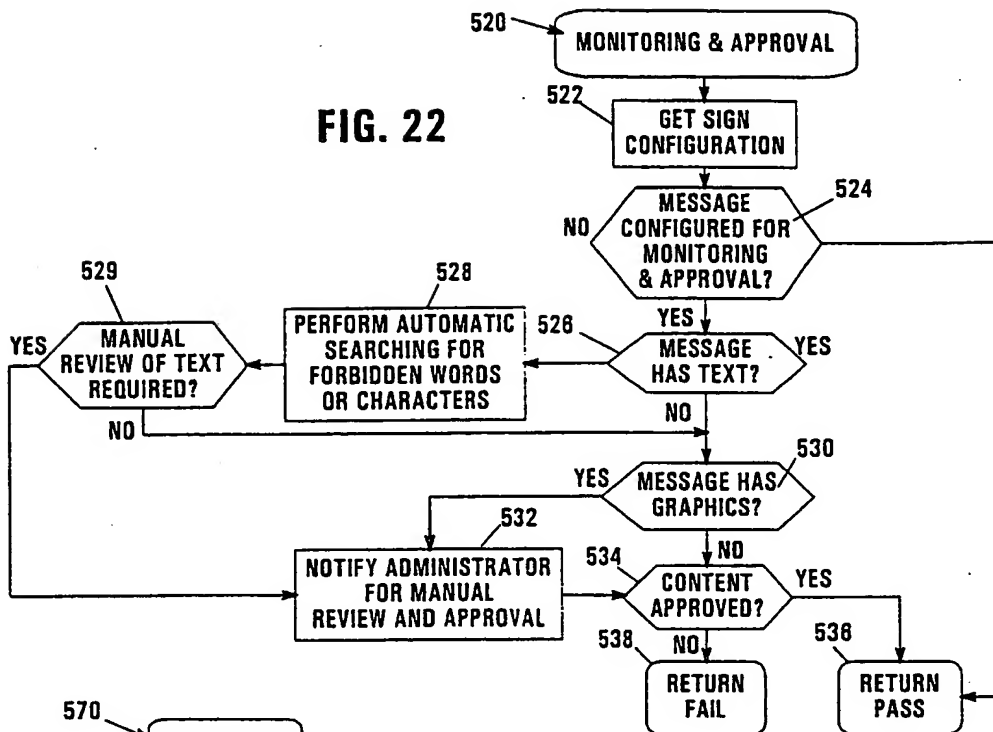
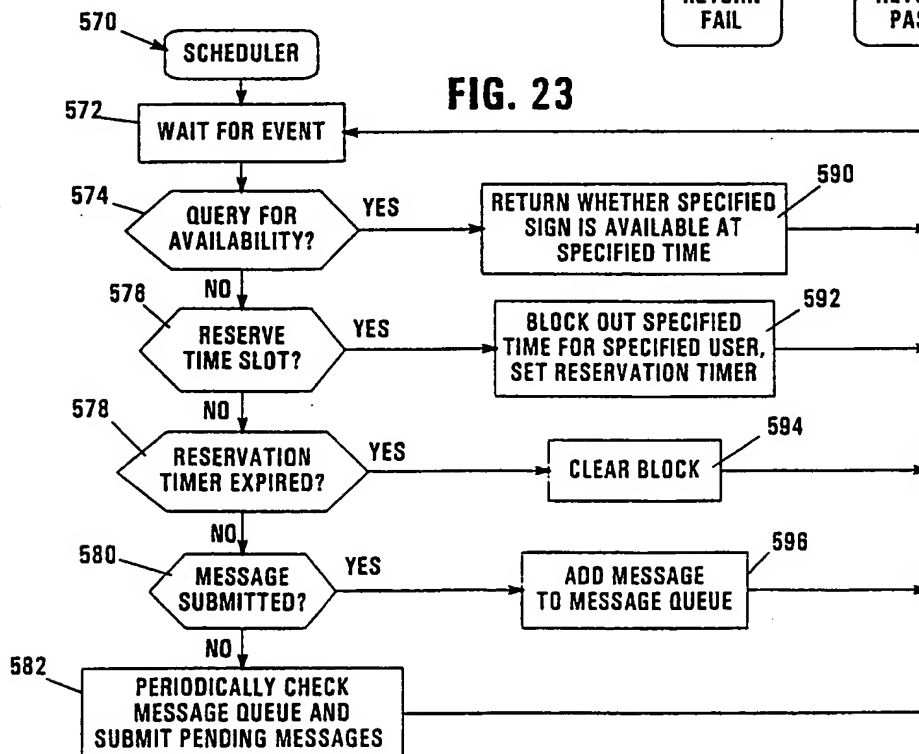
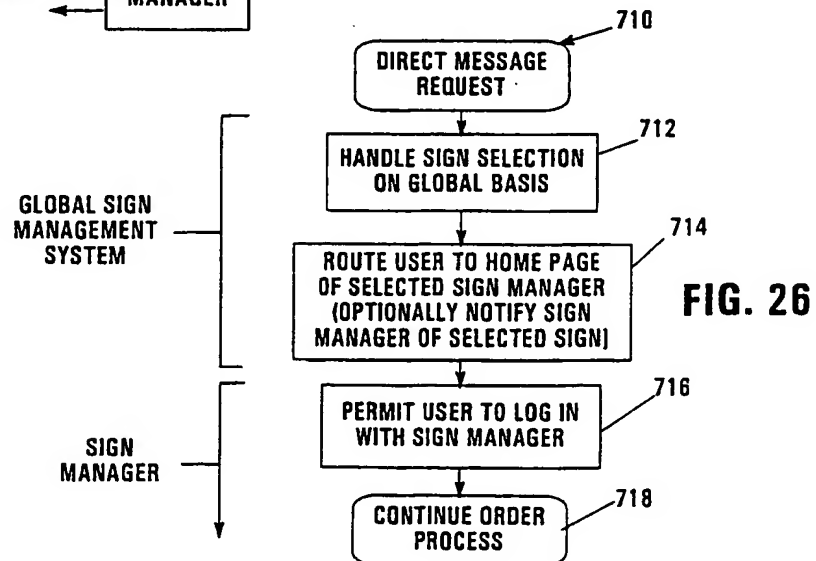
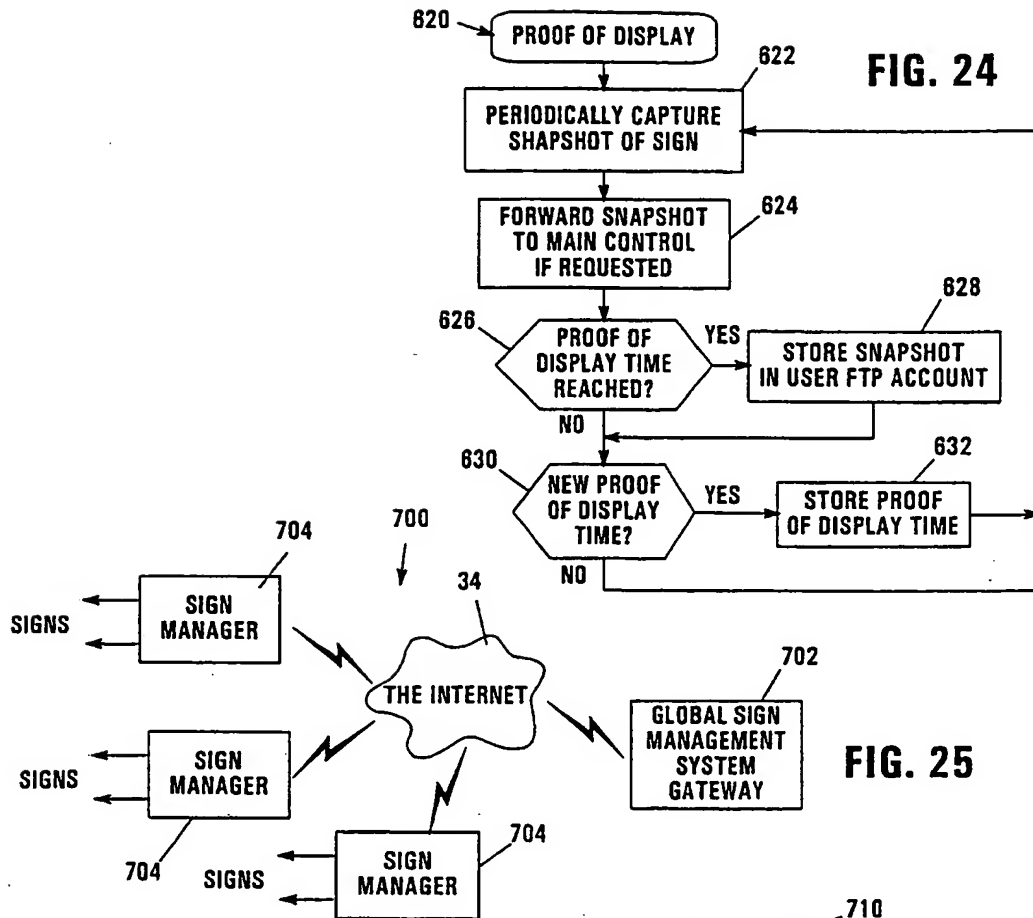


FIG. 23



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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 00/10260

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G06F3/147 G06F17/60 G09F19/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06F G09F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE TUNNELKRANT IN LEIDSCHENVEEN, 'Online! 5 October 1998 (1998-10-05), XP002144153 Retrieved from the Internet: <URL:http://www.factory.org/tunnel> 'retrieved on 2000-08-01! see pages: "intro", "meedoen", "filter" and "de rel" (pg. 1 and 2)	1-63
Y	GB 2 286 073 A (JOHNSON PETER ; NORMAN STEPHEN J W (GB)) 2 August 1995 (1995-08-02) page 6, line 1 -page 12, line 25	1-63

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☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

2 August 2000

Date of mailing of the international search report

17/08/2000

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Amian, D

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/10260

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2286073	A	02-08-1995	NONE

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